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Abstract

The purpose of the paper is to analyse and examine legal changes and requirements that affect retirement conditions and retirement rights for women in BH. After a discussion of the theoretical background of the gender gap in pensions internationally and in BH, an opinion survey related to pension system reforms was conducted in FBH. The results show that almost 50% of respondents disagree with the statement that women and men should retire at the same age. The results of the binomial logit regression conducted indicate that pensioners and those who are close to the retirement age are less likely, and men are more likely to respond positively to this statement. We conclude that there is a discrepancy between the desire to eliminate gender disparities in pensions and the willingness to conduct necessary reforms since they come as a bitter pill to swallow.

Keywords: pension reform, FBH, gender gap in pensions (GGP), logistic regression

1 INTRODUCTION

Equality between women and men has been recognised as a fundamental value and driver of economic growth in the European Union (EU). This principle was incorporated in the 1957 Treaty of Rome and today it is included in Articles 2 and 3 of the Treaty on European Union and in Articles 8, 153(1) and 157(4) of the Treaty on the Functioning of the EU (Dessimirova and Bustamante, 2019).

However, more than 20% of older women (aged 65 and over) are at risk of poverty or social exclusion in the EU, compared to 15% of older men (European Commission, 2018). But this is only the tip of the iceberg. The EU data also show differences in pensions between men and women and lower pension coverage among women in all EU countries. Eurostat (2020) reports a gender gap in pensions (GGP) showing the percentage by which women's average pension income is higher or lower than that of men. Pension income includes old age benefits, survivors' benefits as well as regular pensions from individual private plans. The GGP includes only raw gaps, which do not consider the underlying labour market and demographic characteristics. In 2018, women in the EU aged over 65 received a pension that was on average 30% lower than that of men in monetary terms (Eurostat, 2020). Although, over time, the GGP has had a falling tendency, the extent of the gap varies widely among the EU member states. Looking at the extremes in 2018, the largest GGP was in Luxembourg, where women aged over 65 received 43% less money through pensions than men, closely followed by Malta (42%), the Netherlands (40%), Austria (39%), Cyprus (38%) and Germany (37%). For the same year, the smallest differences in pensions between women and men were in Estonia (1%), Denmark (7%), Slovakia (8%), Czech Republic (13%) and Hungary (16%) (Eurostat, 2020). Based upon the available administrative data, our results show that the GGP (in 2018) in one BH entity was 13% for old-age pensions.

In theory and empirical research, there are several factors that try to explain the determinants of GGP. In addition to factors related to the history of work and work

patterns of individuals, determinants of the GGP are related to the specifics of the model of the pension system and its reform. At the same time, gender neutral reforms can have different effects on women and men and ultimately result in a gender gap in access to pensions and in pension amounts. The main purpose of this paper is twofold: firstly, we aim to detect characteristics and elements of the pension system design in BH that may have effects on gender equality in old age, and secondly, by using a survey, we evaluate attitudes and opinions of the Federation of Bosnia and Herzegovina (FBH) respondents related to these characteristics and elements.

After the introduction, we provide a literature review that focuses on the determinants of GGP and the effects of pension design on gender equality in obtaining pension rights. Then we briefly analyse the specifics of the pension system and the gender gap in pensions before we turn to the analysis of the pension system and pension reforms in the two BH entities – Republika Srpska (RS) and its reform of 2011 and the Federation of BH (FBH) and its reform of 2018. Special attention is given to legal changes that may have a particularly important impact on women and hence possible effects on the GGP. In the final part we analyse the results of the survey conducted in 2018 – the year when the latest pension system reform was adopted and began implementation in the FBH. Respondents were asked several sets of questions related to pension system reforms. A special focus is on sets of statements that could have effects on gender issues (amount of pensions paid out to women and men, retirement age, survivors' pensions and the ways and methods of determining the amount of payments to the pension system) as important elements of pension system reform. After we had established that there was a discrepancy between the attitudes of respondents in terms of equalising gender differences in pensions and the willingness to support the measures that lead to such a result, we focused our analysis on factors that affect the respondents' attitudes towards the most important statement related to reform changes affecting GGP – the question of whether women and men should retire at the same age. This question has been in the spotlight of discussion in the public forum and in the media, which is an additional reason for this analysis and accordingly have conducted a logit regression analysis. Based upon literature review and results of the survey conducted, in the final part we provide conclusions and recommendations.

2 LITERATURE REVIEW

Research related to the GGP has been gaining academic interest in the last few years. The European Commission (EC) report published in 2013 analysed the GGP in detail for the first time. The report states that the proposed GGP should be measured as the percentage by which the average pension paid out to women is lower than that paid out to men (Bettio, Tinios and Betti, 2013). By using 2009 EU-SILC results for EU27 member states (excluding Croatia), Bettio, Tinios and Betti (2013) carried out a statistical analysis showing that the EU27 weighted-average GGP is 39%. Later research also confirmed the existence of GGP (see for example Arza, 2015; Burkevica et al., 2015; Tinios et al., 2015; Samek Lodovici et al., 2016; Lis and Bonthuis, 2019).

Literature that deals with GGP determinants analyzes several contributory factors. These are, inter alia, socio-economic factors, factors related to the history of work and work patterns of individuals, and specific determinants of the pension system. Flory (2012), for a study on Germany, analysed the socio-demographic characteristics of the GGP and concluded that there are intra-country geographical differences in the occurrence of the GGP. Marital status proved to be an important factor since GGP was higher for those who were married and widowed than for the single and divorced. This study also showed that higher the level of education the lower GGP, and that GGP was lower for younger than for older cohorts.

Bettio, Tinios and Betti (2013) argue that the GGP is associated with the shorter careers that women have compared to men. Their research showed that the lowest GGP was found in the public sector and the highest among pensioners who had been self-employed. Marital status also proved significant in their study: GGP was lowest for single and highest for married women, while for divorced women it was somewhere in the middle.

Burkevica et al. (2015) claim that the main determinant of GGP is the gap in lifelong earnings. The GGP is also affected by lower or intermittent social security contributions, which arise from caring responsibilities, during pregnancy and a greater propensity for part-time work among women than among men. Their research also indicated that childcare, especially in countries where such a service is too expensive or not well organized, could deepen the GGP.

Arza (2015), in her paper, concluded that the main determinant of GGP is the difference in the life course between women and men. Women's life course is characterized by longer periods of caring for others, lower labour market participation, more part-time employment, and lower wages. All this affects gender equality in pension rights even when the pension system is established on gender-neutral principles.

Similar results were obtained in a study by Samek Lodovici et al. (2016). On the one hand, the results of the study indicate that high GGP is the result of factors related to labour market imbalances (gender gaps in employment, difference in working years, types of employment – full versus part-time jobs, and in pay) and the design of pension reforms. Women with caring responsibilities and women living alone are particularly exposed to low pension benefits and to high poverty risks in old age. On the other hand, pension reforms can also increase the GGP.

Chłoń-Domińczak (2017) also found that the main determinants of GGP are past labour market tendencies and the design of pension systems. This study also suggested a different way of calculating GGP through the concept of Forward-looking Gender Pension Gap Index. The index measures the extent to which gender differences in the labour market in association with the design of the pension system can contribute to GGP. The index is based on a set of indicators such as career length, work intensity, and pension system features. The proposed index is

based on weights chosen to reflect expert assessment of the risk posed by selected indicators to the future GGP (Chłoń-Domińczak, 2017). This index is not discussed further in the paper.

Lis and Bonthuis (2019) argue that gender differences in the labour market are a key driver of GGP. They conclude that although pension systems manage to reduce the cumulative inequality of wages from work to different levels in EU countries, the pension system alone cannot solve the GGP that arises from inequalities in the labour market.

Apart from the literature that deals with the determinants and size of the GGP, a great number of authors analyse gender equality and pension design from sociological, political, legal, or feminist aspects. Such analysis does not deal with the size of the GGP.

For example, Even and Macpherson (1994) show that there are differences between men and women in the coverage as well as in the amount of pensions. They show that the percentage of retirees receiving a private pension benefit is 66% for men, but only 24% for women. In addition, gender differences in labour market experience and earnings are much smaller among workers receiving pensions. Approximately two-thirds of the gender gap in pension coverage can be accounted for by differences in labour market histories, even without controlling for income (Even and Macpherson, 1994).

Johnson, Sambamoorthi and Crystal (1999) came to different conclusions since they analysed pension wealth for full-time workers with pension coverage. They concluded that the median pension wealth on the current job was 76% greater for men than for women, and that the gender gap was even larger among workers who had only defined contribution plans on the current job. They also state that gender differences in the wage earned in the current job are the main determinant behind the wealth gap. Their results show that one third of the gender gap in pension wealth could not be explained by gender differences in education, demographics, or job characteristics.

Conclusions provided by Bardasi and Jenkins (2010) are also different from those provided by Even and Macpherson (1994). After analysing gender differences in income from occupational and personal pensions and annuities ("private pension income", PPI) in Britain conditional on receipt, they conclude that both components of the overall gender gap arise mainly because female characteristics are less well rewarded than male, rather than because women have less advantageous personal characteristics than men (Bardasi and Jenkins, 2010).

Barrientos (1998) analyses the absence of a gender gap in private pension coverage. His conclusions based upon Chilean experience show that working women have rates of personal pension coverage which are marginally higher than men's since determining factors influence men's and women's personal pension plan

contributions in a similar direction. While structural factors, such as the household division of labour and women's disadvantages on the labour market, entail gender differences in the probabilities of personal pension contributions, the design of personal pension plans significantly reduces the impact of employer influence over pension design and provision as another important structural restriction on women's pension affiliation.

Jefferson (2009) provided an exhaustive literature review grouped in accordance with different elements of the pension system (contributions, benefits, financing, and management). The author concludes that there are at least three policy directions that could result in gender equality in pension schemes. The first policy direction is to focus on women's workforce participation and lifetime earnings. The second direction is to address specific features of pension-scheme design to meet the needs of those with interrupted employment patterns and low earnings. A third direction is to improve gender equality by ensuring access to pension benefits on a basis that is independent of individual workforce participation patterns.

Ståhlberg, Kruse and Sundén (2005a; 2005b) conclude that to prevent poverty among retired women and to provide them with an adequate income, pension systems should be public and mandatory. Additionally, pension systems should: provide a minimum of guaranteed benefits, provide incentives to work, should not penalize women by giving a lower rate of return on their contributions, should not penalize the raising of children economically but rather provide compensation to families with young children, have indexed benefits, pay benefits in the form of annuities, allow spouses to share their rights and, ultimately, if benefits are provided for survivors (widowed), the pension system should ensure that these benefits are actuarially fair (Ståhlberg, Kruse and Sundén, 2005a).

3 PENSION SYSTEM SPECIFICS AND GENDER GAP IN PENSIONS

Specific pension design features and characteristics can reproduce or mitigate gender inequalities in pensions. Today, there are several types of pension system design across the world where the question of whether it is private or public has in itself no gender effect on incentives and redistribution. Both public and private pension systems can be mandatory and/or voluntary, are not mutually exclusive, which indicates that these and several other combinations are available in practice. For example, public pension provision with relatively universal coverage is advantageous for women but such schemes generally provide only a modest income and are accompanied by other ''pillars'' or ''tiers'' that rely on some form of nexus with employment history (Jefferson, 2009). Pension systems in each country can combine pillars such as: (a) a "zero pillar" of basic non-contributory public benefits; (b) a "first pillar" of mandatory public pensions; (c) a "second pillar" of mandatory private pensions; and (d) a "third pillar" of voluntary pension savings (Arza, 2015). If we are considering relationship between voluntary and mandatory, mandatory annuities favour women more than men (Ståhlberg, Kruse and Sundén, 2005a). However, even with the combinations of tiers and pillars,

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other specifics of the pension system shape the impacts that a pension system has on women and men together with other market-related specifics (for example, investment opportunities and risks for private capital accumulation).

The specifics of the pay-as-you-go system (indexed or not) versus the funded scheme are usually in the spotlight of academic discussions (for example, Ståhlberg, Kruse and Sundén, 2005a, 2005b; Jefferson, 2009). These especially relate to the fact that in either case, women are more exposed to risks (for example, risk of low growth or low rate of returns/high volatility in returns, etc.). Individual risk in a funded system with individual accounts indicates that women are, again, at risk of receiving lower retirement income since they are more risk averse then men (even though there are other factors affecting the position of women, for example, marital status). As "the pay-as-you-go system is dependent on changes in the labour force and in productivity, and funded scheme on interest rates in the capital markets" (Ståhlberg, Kruse and Sundén, 2005a: 13), the effect on potential gender inequities depends on the link between an individual's contributions and benefits.

Hence, yet another specific of the pension system design that might influence gender issues is related to deciding between defined benefit plans (DB) and defined contribution plans (DC). In the DB system (regardless of private or public, Jefferson, 2009), women are favoured in comparison to men since they live longer, "while in the DC system, gender pay gaps translate into relatively lower pension contributions" (Jefferson, 2009: 122). It must be noted that issues of coverage, contributions and benefits calculations are very important in the DB and DC schemes and do not solely rely on financing (Jefferson, 2009). In that sense, regarding specifics of pension age, in DB plans, women are often permitted to retire earlier than men, which means that women could increase their lifetime benefits by retiring early. "In DC plans that are actuarially fair, lifetime benefits do not increase if women retire early" (Ståhlberg, Kruse and Sundén, 2005a: 14). In fact, the redistributional-actuarial model equalises men and women and it is a system based on the direct link between paid contributions and benefits. Some public funds use the so-called "unisex tables" (Arza, 2015) and hence redistribute income in favour of women. Thus, men as a group provide an element of cross-subsidization for women (Jefferson, 2009). To minimise gender gaps and pension-income gaps, benefits formula can be flat or means-tested. Either case benefits women as usually low-income earners. However, a means-tested benefit system favours women as a group even though it carries an additional set of risks related to labour market supply. Also, government-mandated minimum pension benefits or minimum universal benefits together with state contributions, payment of annuities based on unisex tables are some methods of minimising risks related to DC schemes (Jefferson, 2009). Yet, another specific of a pension system might be wage indexation (versus price-indexation of pension benefits), which benefits women more than men (Ståhlberg, Kruse and Sundén, 2005a).

It is often believed that survivor's pensions favour women more than men because women live longer. However, survivor's pensions can be received by both women

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and men and hence the survivor's pension system is a redistribution in favour of couples (Ståhlberg, Kruse and Sundén, 2005a).

4 PENSION REFORMS IN BH AND GENDER

BH is a sovereign state located in Southeast Europe and on the Balkan Peninsula. The Dayton Peace Agreement, which is BH's Constitution, states that BH consists of two entities: the Federation of BH (FBH) and Republika Srpska (RS) in addition to one District (Brčko District). According to the latest available data, BH has a population of 3,531,159 inhabitants (BHAS, 2020a) of whom there are 670,792 pensioners (BHAS, 2020b).

Since a pension system can be used as an instrument to mitigate gender differences (Dessimirova and Bustamante, 2019), we provide information related to reforms of pension the system in BH. From 1943 until independence in 1992, BH was a part of SFR Yugoslavia, one of its six republics. In that period, the pension system of BH was organised similarly to pension systems of the Soviet bloc countries. After the end of the war in BH (1992-1995) and the new Constitution that the Dayton Peace Agreement brought, BH's two entities were put in charge of organising the pension system in BH. Hence, during 1998 these entities created the legal bases for and organised two separate pension and disability insurance funds that operate under entity laws. Since both pension insurance systems were developed out of the pre-war system, the pension systems in the RS and the FBH were similar in many elements. In both entities, the basic principles that pension and disability insurance relied on were reciprocity, intergenerational solidarity, and compulsory payments for all employees. Thus, the pension systems were designed as Pay as You Go (PAYG) systems. Citizens who were not compulsorily insured could exercise their rights from pension and disability insurance through voluntary insurance. However, despite the constitutional requirement to provide basic income for all citizens, the coverage of the statutory contributory pension scheme was virtually limited to the formal employment sector (ILO, 2009).

The most recent pension system reforms in BH took place in different years in the two BH entities. The new Pension and Disability Insurance Law was passed in 2011 in the RS and in the FBH in 2018. Although the two laws have brought substantial changes, both entities' pensions systems are still organised as PAYG systems operating under the same principles of reciprocity, intergenerational solidarity, and compulsory payments for all employees. The voluntary insurance option for citizens is also left as an option in both entities. As noted in the previous section, the characteristics of the pension system design described do not have an impact on gender. In BH, the second and the third pillar of the pension system are not yet developed, which could even have a positive impact on the position of women; in the first pillar of the pension system, men and women are provided with (more or less) equal access to public pensions, while this might not be the case with the other two pillars, where access could be more difficult for women. However, Tinios et al. (2015) state that "countries with developed multi-pillar pension systems such as the

Netherlands, United Kingdom, Switzerland, and Denmark are still found all through the spectrum of GGP in Europe" (Tinios et al., 2015: 56).

One significant legal change applied in both entities under the pension system reforms relates to the change in the calculation of a pension. The change in both entities introduced the points system which directly correlates the amount of a pension with the amount of contributions paid and the payments history. Hence, in both entities, the amount of the old-age pension received by the insured is calculated by multiplying the annual value of the personal coefficient by the value of the assigned point (Articles 43 and 44 of the Law on Pension and Disability Insurance in the FBH and the RS, respectively, Official Gazette of the FBH 13/18 and Official Gazette of the RS 134/11).

The personal coefficient is calculated by dividing the total amount of salaries (which represents the insurance basis of the insured) by the average annual salary for the same year. The calculation of the annual personal coefficients in both entities starts from 1st January 1970 and excludes several years due to the war in BH (1992, 1993, 1994 and 1995 in the FBH and 1992 and 1993 in the RS). With this change, although gender neutral (the law does not differentiate special terms for men and women), the reform reflects the conditions operating in the labour market. As noted in section 3, gender pay gaps translate into relatively lower pension contributions from women in DC schemes. Hence, according to Tinios et al. (2015) it could lead to an increase in gender differences. With pension system reforms under way, the adopted and implemented changes caused concerns for many workers receiving the minimum wage across BH. Namely, in BH, a great number of paid out salaries are earned in the shadow economy especially for minimum wage workers in BH[1] through the mechanism of grey pay or envelope salaries. This issue affecting the insurance basis was recognised more than a decade ago in the ILO reports. ILO (2009) stated that "only the public sector and large-sized (mostly foreign) private companies reported the actually paid wages. For a large part of private sector employers, it is a common practice to pay only the minimum wage through official channel[s] (e.g., bank transfer) to their employees and pay any others in cash" (ILO, 2009: 8). The minimum wage in BH is received by more than a quarter of BH employees – 26.3% of total employees (Papić, 2017) and women dominate among the lowest paid workers in the labour market (Agencija za ravnopravnost polova, 2018). There is a particularly large number of employed women in several sectors such as health care, education, agriculture, and the informal sector.

Many women are employed under fixed term, through part-time employment contracts or are excluded from the formal labour market, so they work in the grey economy (Agencija za ravnopravnost polova, 2018). According to the latest

[1] The estimated size of the shadow economy in BH for 2015 (latest available year) was 29.9% of GDP using the MIMIC approach (Medina and Schneider, 2018).

available data from the Agency for Statistics of BH for 2019, the employment rate of women in BH was 26.7% and was lower than the employment rate of men which is 44.6%. In the same year, the unemployment rate for women was 18.8% and for men 13.6%. (BHAS, 2019a). According to the data from the Labour Force Survey from 2019, as many as 61.1% of unemployed women and 59.9% of men have been looking for a job for more than two years. This length of job waiting leads to a high inactivity rate, which in 2019 was 67.1% for women and 48.3% for men (BHAS, 2019b). The reasons for the high rate of inactivity in the labour market may be that women have given up looking for work or cannot work although they wish to. The common reasons for such situation are caring responsibilities and unpaid family work. The two entities' Labour Laws entitle women to a full year of maternity leave. During this period, they are also entitled to monetary compensation. However, women on maternity leave often do not receive such compensation and are under pressure to return to work while on leave, and some even lose their jobs if they become pregnant. In addition, women on maternity leave do not receive equal compensation in all parts of the country, and the payment depends on the woman's residence (Cancho and Elwan, 2015). Women in BH face additional barriers in the labour market, such as: longer waits for their first job, longer interruptions in work experience due to maternity leave or care for elderly and sick family members – caring responsibilities and unpaid family work, inability to enter the labour market primarily due to age, changes in the labour market which cease to demand certain type of work-lack of employment opportunities in the labour market (Hasanbegović, Dizdar and Agić, 2019). In addition, in BH, there is also a gender gap between paid and unpaid work, with the participation of women in unpaid work estimated at 70% (Agencija za ravnopravnost polova, 2018). Furthermore, there are visible gender differences in the hourly rate in favour of men. These differences are noticeable at all levels of education, age groups, occupations, and industries. Considering the population working for wages or per diems and limiting the age to the range of 15-64 years, gender differences in the hourly rate are estimated at 9% of the average hourly rates of male workers (Cancho and Elwan, 2015).

Introduction of the points system, which provides a closer link between contributions and benefits, may have dual effects. According to Samek Lodovici (2016), the first is that workers are encouraged to pursuit a longer career and therefore stimulates a greater participation by women in the regular labour market. The second effect relates to several aforementioned labour-market conditions (women earn less than men on average and work with irregular and interrupted career patterns). As a result, women are more likely to be more heavily penalised than men (Samek Lodovici et al., 2016: 21). However, the points system has several advantages that ought to be noted such as: it enables a fairer evaluation of the entire length of pensionable service (the same value of points for each year and each amount of salary), a precise calculation of the value of pensions for each point, it is administratively easier to apply and is more transparent and understandable to users (FBH Government, 2013).

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Another legal change that may have an effect on the position of women in pension is the change in the system of the calculation of the pension. The previous system of calculating pension basis provided the legal possibility for taking only "the best employment years" for calculating pensions whereas the new system takes all the years for calculating pensions. The literature suggests that this shift may penalise women with irregular and interrupted career patterns (Samek Lodovici et al., 2016: 26).

Compared to previous legal solutions, the current pension system reform has brought changes related to old-age pensions in both entities. In the FBH, Article 40 of the new Law on Pension and Disability Insurance remains an earlier provision, that the right to a standard old-age pension is acquired from the age of 65, with a minimum of 15 years in service and a minimum of 20 years of paid pension insurance for both genders. Additionally, the legal right to an old-age pension is obtained when the insured person reaches 40 years of paid pension insurance, regardless of age (Official Gazette of the FBH 13/18). Current FBH legislation still recognises the early retirement option (Articles 142 and 143). Under such legal provisions, a man is entitled to an early old-age pension if in 2018 he was 60 years and six months old and had 35 years and six months of paid pension insurance. This condition increases by six months (half a year of life and half a year of paid pension insurance), so that in 2027 it reaches the general conditions for old-age pension. For women, the condition for early retirement in 2018 was the age of 55 years and 6 months and 30 years and six months of paid pension insurance. As with the legal provisions for men, every year, the condition increases by six months (half a year of life and half a year of paid pension insurance), so that by 2037, the conditions for retirement for men and women will be equalized. In addition, insured persons over the age of 62 and 40 years of paid pension insurance are entitled to early retirement.

In the RS, the new pension system law equalizes the condition for men and women to retire, and according to the provisions of Article 41 of the Law on Pension and Disability Insurance of the RS, the right to an old-age pension is exercised by both men and women at the age of 65 and at least 15 years of paid pension insurance (Official Gazette of the RS 134/11). Legal provisions in the RS also recognize the early retirement option. Under the current law, an insured person (male) can exercise the early retirement right for old-age pension when he turns 60 years of age and has a history of 40 years of paid pension insurance. For women, the same criteria for early old-age retirement are 58 years of age and 35 years of paid pension insurance. In addition, as in the FBH case, Articles 177 and 178 regulate the period of transition until 2024. Hence, the condition for early retirement for a woman in 2012 with 15 years of paid pension insurance who was entitled to an old-age pension was that she had to be 60 years and four months old. Each subsequent calendar year, the condition increased by one year until she reached 64 years and four months in 2018. An insured man with 40 years of paid pension insurance in 2013 could retire at the age of 56, and in each subsequent year this condition

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increased by 4 months, so that in 2024 he would have 59 years and eight months and 40 years of paid pension insurance. An insured woman in 2013 could exercise the right to an old-age pension at the age of 54 with 35 years of paid pension insurance. The age requirement increases by four months each year so that by 2025 it ought to reach the general requirement for women (58 years).

Changing conditions for old-age and early retirement and differences in conditions between women and men have been part of the pension system reforms in many countries. However, the direction of change and the justification for it have changed over the years.

In the second half of the twentieth century, in almost all OECD countries, a significant decline in the old-age requirements was recorded. The average pension age in 30 OECD countries fell from 64.3 years in 1949 to 62.4 years in 1993 for men. For women, the fall over the same period was also just under two years, from 62.9 to 61.0 years in 1993 (OECD, 2011). Explanations for earlier female retirement may be found in the following aforementioned factors: women have fewer healthy years of life in relation to their entire life expectancy, caring responsibilities, unpaid family work or lack of employment opportunities in the labour market (Burkevica et al., 2015; Samek Lodovici et al., 2016).

However, from the late 1990s until today, most countries have been implementing reversed reforms in comparison to those until 1990 and have been increasing paid pension insurance. In addition, the gradual equalization of the age at which the right to an old-age pension for men and women is exercised is a reform that has been implemented by almost all EU member states. In 2015, in 11 member states (BG, CZ, EE, HR, IT, LT, AT, PL, RO, SK, UK), women could still exercise the right to lower statutory retirement ages than men. Following recent reforms, by 2020, gender differences in retirement years would remain in only six countries (AT, BG, HR, CZ, PL and RO). After 2020, Samek Lodovici et al. (2016) stated that only two EU member states (BG and RO) were expected to continue to have gender differences in retirement ages.

Such changes could have a twofold effect on the GGP. The first effect could be positive since due to the increase in the number of years women spend in the labour market, an expected long-term positive impact on the adequacy of women's pension rights and a reduction in the GGP could occur. However, the other effect on the GGP might be that the higher retirement age can increase the burden of caring for women since it does not consider the fact that older women are burdened with unpaid family jobs and care for their relatives and grandchildren (Samek Lodovici et al., 2016).

In terms of survivor's pensions that might also affect the size of the GGP in BH, both entities' laws have dealt with this issue as well and have tightened the use of pension rights in this section. According to the provisions of both laws, a widow is

entitled to a survivor's pension if on the day of death of the spouse, she has turned 50 years of age and for a widower if he has turned 60 years of life. Other legal provisions remained unchanged from the previous legal solutions. In addition, a spouse from a divorced marriage has the right to a survivor's pension in the FBH, if the Court has determined the right to alimony (note the previous legal conditions related to age). In the RS, in addition to the spouses from a divorced marriage, a spouse from an extramarital union has the right to a pension under the same conditions.

Issues related to survivor's pensions' retirement rights usually affect women more than men since women usually live longer than men and are traditionally younger than their male spouses. Women who have not achieved their own pension rights may be particularly vulnerable in old age if they are not entitled to a survivor's pension or some other form of entitlement such as the social pension as it is called. Bettio, Tinios and Betti (2013) emphasize that survivor's pensions can have significant effects on reducing the GGP. The paper by Tinios et al. (2015) has showed that even if the age group over 80 years is excluded from the analysis, the GGP excluding survivor's pensions remains equally large.

Rights from survivor's pensions are derived from traditional family patterns, namely the role of gender (breadwinner model), which includes economic support to family members' roles (in most cases for women) after the death of the partner. However, the increasing percentage of divorces, the large number of women who do not marry on the one hand, and the increasing participation of women in the labour market on the other, are leading to this traditional approach being increasingly reconsidered. Samek Lodovici et al. (2016) believe that to improve the position of women, including pension coverage and to reduce gender stereotypes, individual pension rights rather than survivor's pension rights should be adopted. Also, the focus should be on the role of women in the labour market and not in the family (regardless of whether as a wife or a widow, Samek Lodovici et al. 2016). Along those lines, Arza (2015) argues that survivor's pensions for the widowed have also been losing effectiveness for the protection of elderly women as families change. Survivor's pensions also raise the issue of the redistribution of pensions for single people and divorced couples (Arza, 2015).

However, it should be emphasized here that reconsideration of the need to exercise the right to a survivor's pension may be more relevant in countries with developed welfare systems. However, in BH, social protection is inefficient and not focused on the real needs of beneficiaries and with a very low impact on poverty reduction, where only 18% of people from the poorest fifth of the population receive cash benefits through social protection programs (Direkcija za ekonomsko planiranje BH, 2009). Under such circumstances, survivor's pensions can only be viewed through the prism of improving the social status of this vulnerable group and reducing the gender gap. In this sense, the inclusion of divorced and unmarried spouses can lead to an improvement in the position of women, while tightening the conditions for retirement from a deceased spouse could worsen the position of women.

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4.1 PENSION SYSTEM IN BH

In the total population of pensioners in BH, more than a half are women (51.6%) (BHAS, 2020b). If we look at the structure of pensions (table 1), the highest share of pensions paid to the beneficiaries goes to old-age pensions (61.4%), survivor's pensions (29%) and the rest (9.6%) to disability pensions. Data provided in table 1 for the period 2014-2018 show that the number of old-age and survivor's pensions' beneficiaries is continuously increasing while the number of disability pensioners has had a falling trend[2]. Pension and disability insurance are regulated by two entities' social security contributions laws. Hence, pension and disability insurance are financed through obligatory contributions at the rates of 23% in the FBH (17% paid by employee and 6% paid by the employer) and 18.5% in RS (paid by the employee).

Table 1

Overview of the number of pensioners by years, pension categories and gender in BH

Pension category	2014		2015		2016		2017		2018	
	m	f	m	f	m	f	m	f	m	f
Old-age	247,420	118,596	258,555	122,522	259,308	133,850	267,068	136,933	272,828	139,328
Disability	54,287	24,437	49,015	21,119	47,937	22,095	44,614	20,626	44,309	20,244
Survivor's	9,412	186,408	9,336	186,002	7,894	187,317	7,659	186,926	7,443	186,640
Total	311,119	329,441	316,906	329,643	315,139	343,262	319,341	344,485	324,580	346,212

N.B. Number of men and women in the survivor's pensions section is estimated since the Pension and Disability Insurance Fund of the RS does not classify this type of pension by gender.

Source: BHAS (2020b).

Official statistics indicate that in June 2020, the average pension paid in the RS amounted to BAM 342 (EUR 174.9) while in the FBH it was somewhat higher and amounted to BAM 418 (EUR[3] 213.7). The very low pensions in both BH entities reflect the macroeconomic indicators in the country. BH faces several macroeconomic issues such as high emigration rates and ageing population (Pijalović et al., 2018; Begović et al., 2020), high unemployment rates especially among women and young people, slow and sluggish economic growth characterized by, *inter alia*, high, and inefficient public consumption and by trade deficits (see BHAS, 2019a). With the outbreak of COVID-19 in 2020, BH's GDP is expected to fall by 3.2% in 2020 (Kikoni and Schiffbauer, 2020) and the economic recovery in the next two years is also expected to be slow.

Table 2 provides information related to the GGP in the RS for old-age and disability pensions from 2014 to 2019. The GGP shows the percentage by which women's average pension income is higher or lower than that of men. It has been calculated based upon the actual administrative data on the size of average pension income for women and men, and as noted in table 2, separately for old-age pensions (including early-retirement old-age pensions) and for disability pensions. Survivor's pensions were excluded from the analysis. If we look at the movements in both types of

[2] With the outlier in 2016 when the number of women receiving disability pensions was increased.
[3] Fixed exchange rate between EUR and BAM, EUR 1 = BAM 1.95583.

pension categories, we can see the following trend: in 2014, the GGP for both pension categories was almost equal and in 2019, the GGP indicator for both types of pensions started moving in different directions. Hence, over the observed period, the GGP for old-age pensions narrowed from 16.4% to 11.5% while it widened for disability pensions from 16.6% to 19.1%. The movements in the GGP over the period indicate that the reform changes have had consequences in the form of increasing or decreasing the GGP. On the one hand, the reduction in the GGP for old-age pensions may be a consequence of the reform changes whereby the right to exercise the old-age pension for women and men is becoming more equal. As indicated in the previous section, in the observed period 2014-2019, the old age retirement age for women in the RS increased while for men it remained unchanged at 65. This legal change means that women spend more time at work and consequently, there is a reduction in the size of GGP. On the other hand, the size of disability pensions could be determined by several factors primarily related to the methods of calculation. Disability pensions in the observed period have been calculated by the introduced points system with the full-service period calculation, which means that pensions are proportional to contributions paid. Regarding the life-course patterns of women and characteristics of the labour market in BH (for example, women dominate among the lowest paid workers, have interruptions in their work experience due to maternity leave or care for elderly and sick family members, gender differences in the hourly rate in favour of men, etc.), GGP in the RS for disability pensions increased over 2014-2019 period. We have only analysed the GGP in the RS due to the fact that in FBH we were officially informed that there is no track of the financial data necessary to calculate the GGP in FBH.

Table 2

The size of GGP (in %) by pension category in the RS

Pensions	2014	2015	2016	2017	2018	2019
Old-age	16.4	15.5	14.7	13.5	12.6	11.5
Disability	16.6	17.1	17.5	18.1	18.7	19.1

N.B. as previously noted, Pension and Disability Insurance Fund of the RS does not classify survivor's pension beneficiaries by gender.

Source: Pension and Disability Insurance Fund of the RS, 2020; own calculation.

5 AN ANALYSIS OF ATTITUDES TOWARDS PENSION SYSTEM REFORMS IN THE FBH THAT COULD AFFECT THE POSITION OF WOMEN

In February 2018 we conducted a public self-administered online survey. During four weeks of data collection, we acquired 623 responses by using the exponential non-discriminative snowball sampling technique. The survey was based on the Eurobarometer survey 161/wave 56.1 conducted in 2001. Since the original questionnaire was conducted almost two decades ago, it had to be slightly modified to reflect the FBH specifics. These especially relate to legal and cultural characteristics which were included in the questionnaire after we obtained comments from two public sector experts. In addition, to avoid misinterpretation in the statements

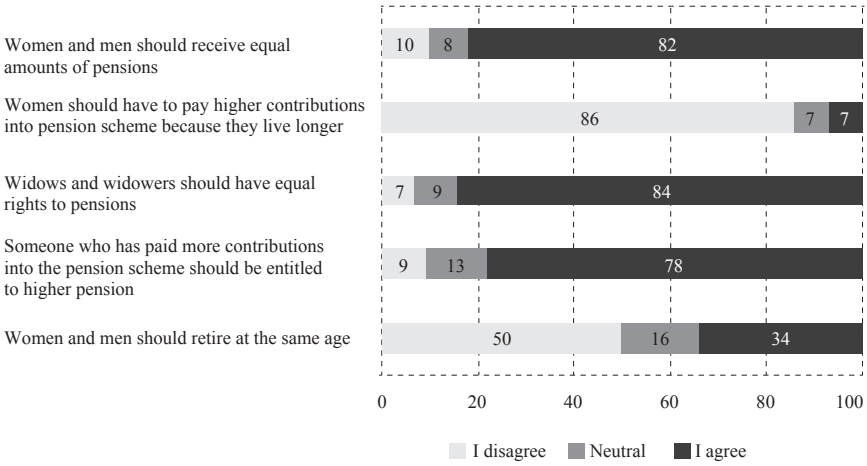
and questions in the survey, the survey was translated into the local language and then translated back to English.

The respondents' attitudes regarding pension system reform changes that might affect the position of women (potentially increase or decrease gender gap) were assessed by using a five-point Likert-type scale (1 – "absolutely disagree", 2 – "disagree", 3 – "neither agree nor disagree", 4 – "agree", 5 – "absolutely agree"). Responses were grouped as follows: responses 1 and 2 were grouped as disagreeing responses, 3 as a neutral response and 4 and 5 as agreeing responses.

More than 80% of our respondents believe that there should not be any gender differences. The statement that women and men should receive equal amounts of pensions was responded to positively (82%) and only 10% disagreed (8% were neutral). The results from Chi-square test (chi2(1) = 0.2306, p-value=0.631) indicate that at 5% significance level, there is no statistically significant relationship between the responses to this statement and the gender of the respondents.

Figure 1

Attitudes of respondents regarding pension system reform elements that might affect pension gender differences (in %)



Source: Authors.

However, if we analyse the pension system reform changes that might affect the position of women, we notice an inconsistency in the responses (figure 1). On the one hand, the obtained responses that are gender-sensitive are in line with the previous statement. For example, only 7% of respondents agreed with the statement that "women should pay more into the pension system because they live longer", while 84% agreed with the statement that "both widows and widowers should have equal rights to pensions". On the other hand, the attitudes of respondents that contain a certain trade-off show a discrepancy with the willingness to eliminate the gender differences in pensions. The statement that "someone who has paid more

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contributions into the pension scheme should be entitled to higher pension" received 78% positive responses. This change could lead to an increase in the GGP (i.e., tighter linking of the amount of pensions with the amount of paid contributions). However, the statement "that women and men should retire at the same age" received only 34% of positive responses even though this change could lead to narrowing of the GGP.

In the previous discussion, we have determined that equalising retirement age for women and men could narrow the size of the GGP. We have also determined that our respondents did not agree on the statement that women and men should retire at the same age, so in the next section we analyse what factors are behind their attitude.

5.1 METHODOLOGY AND MODEL SPECIFICATION

To examine the attitudes and perceptions related to equalized retirement conditions for men and women in the FBH, we have investigated what factors are behind the attitudes of the surveyed respondents. So, the questionnaire included a standard set of socio-economic questions and specific questions related to the status of the pension system, potential reform options and self-reported standard of living. In table 3, we provide summary statistics of the selected variables collected from the sample survey. Based on the collected data, we have calculated that our sample includes 61.2% female and 38.8% male respondents.

From table 3, we can see that more than three quarters of respondents are not retired (76.2%) and more than three-quarters of respondents have obtained at least a university degree (76.9%). In terms of respondents' ages, the greatest number of respondents (31.5%) are in the 35-44-year-old age group even though the average age of the sample was 47.8 years. Respondents were asked to estimate and self-report their living standard. Almost a half of respondents (49.8%) assessed their current self-reported standard of living as average, while only 2.3% of the respondents stated that they were poor or very poor. As a response to the average monthly net household income from all sources (self-reported net monthly income), out of the total of 601 respondents who answered this question, most respondents (25.3%) reported that the monthly income of the household was above BAM 2,500. In addition, almost a third of the respondents stated that they live in a household where the net monthly income is BAM 1,000 or less.

As a response to the statement regarding arrangements through which pensions should be provided, more than 60% (61.7%) of respondents declare that they should be financed through public funds followed by employer's direct payment to personal accounts of the employee (25.0%), and only 13.3% via private arrangements between individuals and insurance companies, banks. Two thirds of the respondents in the sample live with a partner (66.4%) while one third (33.6%) are single.

Table 3

Sample description (in %)

Factor	Category	Female	Male	Total
Status	0 = Not Retired	79.5	71.0	76.2
	1 = Retired	20.5	29.0	23.8
Age	1 = 15-24	3.8	2.2	3.2
	2 = 25-34	18.4	13.1	16.4
	3 = 35-44	33.0	29.2	31.5
	4 = 45-54	16.2	16.2	16.2
	5 = 55-64	12.9	16.6	14.3
	6 = 65+	15.7	22.7	18.4
Education	1 = Without primary education	0.5	0.0	0.3
	2 = Primary education	0.8	0.0	0.5
	3 = Secondary education	19.7	19.1	19.5
	4 = Qualified worker	0.8	5.9	2.8
	5 = Short-cycle tertiary education	10.1	8.0	9.3
	6 = Bachelor or equivalent	41.1	37.7	39.8
	7 = Master or equivalent	19.3	17.0	18.3
	8 = Doctor or equivalent	7.7	12.3	9.5
Self-reported net monthly income	1 = BAM 350 or less	5.1	2.2	4.0
	2 = BAM 351-700	11.1	12.6	11.7
	3 = BAM 701-1,000	12.4	14.7	13.3
	4 = BAM 1,001-1,500	17.6	13.4	16.0
	5 = BAM 1,501-2,000	16.8	16.4	16.6
	6 = BAM 2,001-2,500	13.2	13.0	13.1
	7 = More than BAM 2,500	23.8	27.7	25.3
Self-reported standard of living	1 = Very poor	1.1	0.4	0.8
	2 = Poor	1.4	1.7	1.5
	3 = Just getting along	14	10.3	12.6
	4 = Average	50.0	49.6	49.8
	5 = Comfortable	24.3	27.3	25.5
	6 = Very comfortable	8.9	9.4	9.1
	7 = Rich	0.3	1.3	0.7
Pensions should be provided through	1 = Private arrangements	12.1	15.0	13.3
	2 = Employer's direct payment to employee's personal account	26.9	22.0	25.0
	3 = Public funds	61.0	63.0	61.7
Marital status	0 = Single	58.0	79.7	66.4
	1 = With partner	42.0	20.3	33.6

N.B. Not-retired category includes self-employed, house persons, other white collars, managers, students, manual workers, and unemployed.

Source: Authors.

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5.2 SHOULD WOMEN AND MEN RETIRE AT THE SAME AGE? THE RESULTS OF THE CONDUCTED SURVEY IN THE FBH

To conduct research related to the statement whether women and men should retire at the same age, we have compiled the answers to this statement as a dichotomous variable, as follows: "I absolutely disagree" and "I disagree" were coded as zero (0), neutral responses were not considered and responses "I absolutely agree" and "I agree" were coded as one (1). Since we had to exclude neutral responses, the size of the sample was reduced to 516. Based on the conducted Chi-square test, we have determined a statistically significant relationship between the response to this statement and gender of the respondents (chi2(4) = 10.6504; *p-value*=0.031).

A binomial logistic regression was conducted to estimate the effects of socio-economic variables of the respondents to the statement related to the equalized retirement age for men and women in the FBH. Hence the dependent variable in the model was the statement whether women and men should retire at the same age. We have included a set of socio-economic independent or explanatory variables, such as employment status, gender, age, self-reported income and standard of living, education, marital status, and attitudes towards means of providing pensions. The results of the regression are provided in table 4.

With a significance level of 0.05, the statistically significant variables are: pensioners, gender and age (at the significance level of 0.05), while education and marital status have a significance level of 0.1. The results of the logit regression model show that pensioners and those who are close to the retirement age (54–64-year-old cohort) are less likely to respond positively to the statement, whereas men and respondents with a tertiary level qualification or higher are more likely to respond positively to this statement. These results are in line with the expectations since those age cohorts closer to fulfilling the full legal or early retirement conditions in the FBH, under the new law of 2018, are less likely to agree that women and men should retire at the same age. The same conclusion, but with a different sign can be reached for men, who believe that women should retire at the same age as they do.

Furthermore, the results of the Chi-square test show that with a significance level of 0.10 there is a statistically significant relationship between the answer to this question and the age of the respondents (chi2 (20) = 28.4570; *p-value* = 0.099). Regarding the effect of the marital status variable on its own, the results imply that, as expected, the respondents that live with a partner are less likely to respond positively to the statement than respondents who are single. Other variables such as self-reported income and standard of living and the means of providing pensions were not statistically significant. To test the suitability of the model specification, we used two tests: the linktest and the Hosmer-Lemeshow test. The results of the linktest indicate that the selected model is well specified (LR chi2(2) =48.30; *p-value*=0.000). Similarly, the results of the Hosmer-Lemeshow test indicate that the selected model fits the data well (HL chi2(8) =3.95; *p-value*=0.861).

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Table 4

Regression coefficients of binomial logit regression

EQU_c	Women and men should retire at the same age
Pensioners	-1.440**
Education	0.450*
Gender	0.486**
Age	
2	-0.985
3	-0.709
4	-0.685
5	-1.292**
6	-0.116
Self-reported income	
2	1.167
3	0.854
4	1.008
5	0.342
6	0.162
7	0.537
Self-reported standard of living	
2	-0.219
3	0.362
Pensions should be provided through	
2	-0.158
3	0.236
Marital status	-0.431*
Const.	-0.316
Observations	448

N.B. Education: dichotomous variable where respondents with a tertiary level or higher were coded as "1" and respondents with qualifications below tertiary level by "0".
Self-reported standard of living: ordinal variable where "Below average"=1; "Average"=2 and "Above average"=3.
**p<0.10, **p<0.05, ***p<0.01.*

Source: Authors.

We also examined the presence of multicollinearity through the assessment of inflation variance factors (VIF). The results showed that there are no variables that cause a serious problem of multicollinearity (VIF<10). The average VIF value of all explanatory variables is 5.2.

6 CONCLUSION

Although equality between women and men is one of the foundations of the EU, in practice, there are still differences in rights and in living conditions between women and men. Women over the age of 65 are specifically at a high risk of social exclusion. Therefore, it is not surprising that there is a growing interest in studying trends and determinants of the GGP across European countries. Even though it has had a falling trend over the past few years, the GGP in EU countries is still high

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and according to the latest available data it amounts to 30%. It is interesting to note that among the EU members with the lowest GGP are the countries of the former Soviet bloc such as Estonia, the Czech Republic and Hungary. BH can also be added to the low GGP group of countries since GGP for old-age pensions in the RS is 13% according to the most recent and available data.

According to most authors, the size of the GGP is determined by factors divided into two basic groups: (i) determinants related to labour market conditions, and (ii) determinants related to the design of the pension system. On one hand, in the labour market, women work fewer years than men since women have caring responsibilities for children and older family members, women are more often employed part-time and do temporary jobs, and ultimately women are paid less than men. On the other hand, determinants related to the design of the pension system include several legal provisions that can act both ways: they can deepen or reduce the GGP even when they are not designed as gender specific.

Changes in legislation resulting from recent pension reforms in the RS in 2011 and in the FBH in 2018 which could have the greatest impact on the GGP are: the introduction of the so-called points system for calculating pensions; the introduction of the full-service period calculation; changes in the legal conditions to old-age and early retirement – gradual equalization of retirement conditions for women and men; introduction of stricter conditions (increase in the widow(er)'s age) for exercising the right to a pension after the death of the spouse and granting the right to a pension to the spouse from a divorced marriage or extramarital union (RS). These changes may have a dual impact on the GGP which was shown in the example of movements of the GGP in the RS in the period 2014-2019 where old-age GGP narrowed and disability GGP widened.

In the FBH survey conducted in 2018, citizens were asked questions related to the pension system reform. Most respondents agreed with the statements: that women and men should receive equal amounts of pensions, that widow(er)s should have equal rights to pensions and that someone who has paid more contributions into the pension scheme should be entitled to a higher pension. They disagreed with the statements that women should have to pay higher contributions into the pension scheme because they live longer, and that women and men should retire at the same age.

The results indicate a discrepancy between the readiness to eliminate the difference in pensions between women and men and the ability to conduct necessary reforms since they come as a bitter pill to swallow. Hence, even though responses indicate a desire to eliminate the GGP (women and men should receive equal amounts of pensions), at the same time, respondents also believe that pensions should be directly associated with paid contributions and that women and men should not retire at the same age. Therefore, we wanted to test and analyse the reasons for such a situation. The results from binomial logit regression model show that pensioners and those who are close to retirement age are less likely to respond positively to the statement, whereas men are more likely to respond positively to this statement.

Apart from the problem of gender inequality, we should not forget the difficult conditions in which pensioners – both women and men are living in both the RS and the FBH, which is why increasing pensions and improving the standard of living of pensioners must be a priority for policy makers.

If the policy makers wish to decrease or even close the GGP, they ought to implement several measures related to labour market conditions. Determinants related to labour market conditions are influenced by different macroeconomic factors and different policies (employment policy, birth policy, social policy, care policy for the elderly and children, gender policy, education policy, etc.). So, improving the position of women, BH requires changes in conditions, cross-sector action, and time for the policies to act. Depending on data availability, future research will include analysis and comparison of GGP trends in BH (FBH and RS) and the EU, as well as panel data analysis of the effects of labour market conditions on the size of the GGP.

Disclosure statement

All authors state that they do not have any financial or other substantive conflict of interest.

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Public value and public services in the post-virus economy

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Abstract

This article explores public value and public management through the lens of economic factors – an unusual stance since public management research mostly features the economy as background rather than foreground. Responding to calls for deeper investigations into public value, it argues that public value is not confined to the formal public sector and should also include use-values created and distributed by households, the third-sector and informal associations. Arguing that economic context is paid insufficient attention in public management research, the paper shows how alternative models are possible based on social reproduction, Regulation Theory, and Modern Monetary Theory as an alternative to traditional Keynesianism – favouring a balanced economy above balanced budget.

Keywords: public value, COVID-19, economics, public management

1 PUBLIC VALUE AFTER THE COVID CRISIS

In the *Great Leveller*, Scheidel (2017) notes that crises rupture social affairs, that crises are never neutral, always posing how things will change, who will suffer economically and who will benefit. If COVID proves to be another *Great Transformation* (Polanyi's 2012 phrase) how will public services be impacted and how, in particular, public value (PV) and public management (PM)? This article explores PV and PM through the lens of economic factors – an unusual stance since PM research mostly features the economy as background rather than as foreground. Responding to Kurz's (2019) important paper arguing that sufficiency should replace efficiency, our article challenges some of his premises and counters Ilyambo and Kaulihowa's (2020) balanced budget argument by counterposing that of the balanced economy.

Our research question – *how might the economic change resulting from the virus crisis impact PV and PM* – follows four threads, each discussing arguments relevant to current PM research on PV. Each thread connects with Mark Moore's (1995) project of liberating PV from the grip of neoliberal economics.

– Firstly, we explore *PV in a post-virus economy* contesting the arguments for de-growth proposed in JPS by Kurz (2019) echoing Jackson (2017) and Kallis (2018). We consider the nature of value and how the concept has been and can be used in PM research (Moore, 1995) and then argue that intractable debates around what constitutes PV, for example (Lindgreen et al., 2019), are the result of narrowly defining it as emanating from services funded by the public purse and delivered by public agencies. Our argument is that PV also arises from use-values (UVs) delivered by non-market arrangements, as opposed to exchange values (EVs) delivered using markets and prices. From this viewpoint, UVs and PV include services and goods provided by the formal public sector, households, the third sector (3S) and directly in communities and amongst family and friends. Taking this PV = UV perspective, PV not only has a wider footprint, resurrecting what EP Thompson (1964) referred to as a *moral economy* but, as will be argued, it is now the dominant form for value distribution, linked closely with policies from the Green New Deal (GND).

– Our second thread is the *post-virus public sector* which considers how PV is deployed in PM research. From our UV = PV stance we criticise Vargo, Maglio and Akaka (2008) marketing perspective and Osborne's (2017) idea that there is a logic revolving around the use of co-creation significantly driving PV creation in public services. We follow ideas from normative economics that PV is also concerned with the just use of authority, in this case by addressing first-order policy issues such as full-employment, inequality and a sustainable environment.
– The *post-virus economic context* of the public sector is our third thread. If neoliberal policies, including austerity are no longer the economic context for public services then what might become the economic context? Both the major orthodox approaches to the economy, we will argue, have proven threatening for public services: neoliberalism hollows-out the public sector and Keynesians too cut back to balance budgets over the economic cycle. We suggest two unorthodox perspectives on the economic context for post-crisis public services: Regulation Theory (Boyer and Shread, 2001) and Modern Monetary Theory (Mitchell, 2020), each seeking to balance the economy rather than balance government budgets. Our approach allows us to reject Baumol's (2012) critique of low productivity in the public sector and instead to support Jansson's (2013) call for an expansion of health, education, and care services (HEC) as a response to social need, automation and demographic change; as Inwin (2019) notes, there is a policy value, which justifies (or not) the accumulation of public debt.
– *Post-virus public policy*, our fourth strand considers three policy areas in which our blending of economics and PM has something new to say. These are: (a) the GND and associated ten-year transformation of economic activity to create a sustainable natural environment and the central role of PM in planning this change. We then (b) discuss MMT's proposed Job Guarantee (Kelton, 2020) as a way of supporting full-employment in a post-virus world and of supporting Jansson's (2013) HEC expansion, working as a *relational partner* (Chung's 2016 phrase) the private and 3S. Finally, (c) we consider how PM can align with wider debates addressing social inequality.

The article proceeds by discussing each of these four themes in turn and considers how important public policy goals might be affected by a fresh way of looking at PV in a post-virus economic setting for public services.

1.1 WHY VALUE?

Why discuss value at all, since it is abstract, complicated, not as simple as price and has contested meanings? Mark Moore approaches value from two viewpoints; firstly (1995) from a user perspective he asks managers to find out *what would be valuable to do* – a demand approach, then (2018) *how best to develop a constituency that values what the manager wants or conceives,* i.e. supply satisfying demand. In PM research, value is what is demanded, in economics value equates to price. Although Vargo and Lusch (2008) make almost no comment on public services, their service-dominant logic approach views value as being in the eyes

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of the beholder: value is what the customer values. Normann (2002) also views value as subjectively experienced, a concept inherent in Osborne's (2017) public service logic, what is termed in Laitinen, Stenvall and Kinder (2017) migrating values-into-value. Tirronen et al. (2020) show how a public agency can create objective metrics using action learning from service users and (for example, financial, quality and service standards).

Until the second part of the 19th century, most economists followed Smith and Ricardo's explanation of prices as related to the labour-time embedded in the product. Only Marx drew the logical conclusion that labour's share of price under-valued labour's contribution, resulting in exploitation. All agreed that the value of a commodity had two aspects. Use-value (UV) was why consumers wanted the product, the problem the product solved. For Marx (1973: 527) UV is the *means of life* the *material life itself.* Exchange-value (EV) was the actual market price. Price did not simply reflect labour hours in the product, since consumers "fetishised" commodities. Later 19th century marginalist economics dropped the UV/EV distinction and with it the labour theory of value, and instead simply equated value with price.

Our argument is that UV remains a useful concept, for understanding public value (PV). Following Elson (1979) we view value as *wealth that solves a problem*. Public services are UVs distributed by non-market channels and are unpriced. They are subjectively and objectively evaluated by service users and accorded PV. Moore (1995) says that PV is *what the public values.* Public management literature now abounds with discussion on PV, for example Osborne (2020). Also, economists such as Milanovic (2016) employ UV as a conceptual tool. Our argument joins these two strands together. We argue that PV = UV or wealth solving a problem, created and distributed by non-market means. UV then re-enters discourse as the boundary between market and society, between EV and UV, between value created for the market and value created for non-market distribution.

Precise terminology is always important. Sandel (2009) speaks of *social value*, meaning individuals' contribution to society; rejecting what he terms economic *monism,* i.e., reducing everything to price. Confusingly Westall (2009) also uses the term *social value*, in her case to mean a blended set of social, economic and environmental metrics, a triple bottom-line. Sen (1999) argues that social values and capabilities, being situated in context and culture, are incommensurable between countries. Social value often underpins the idea in social entrepreneurship of a social return on investment (Auerswald, 2007) a view echoed in Knox and Worpole's (2007) ideas for valuing public spaces. There is clearly merit in this blended social value approach, however, we prefer the term UV since it is conventional in economics literature and has a genealogy of meaning in political economy. PV and UV should also not be confused with public goods such as clean air or beaches, which are non-rivalrous and non-excludable, i.e. free for anyone to use.

PM theorists since Moore (1995) have restricted PV to services delivered by formal public agencies; we differ. UV = wealth = PV takes a wider scope and includes

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in PV the UVs created by households, the 3S, in communities and amongst family and friends. One advantage of our wider footprint for PV is it travels better, since between countries the range of public agency-provided services varies greatly, as Esping-Anderson's (1990) welfare regimes shows. Our view of PV as (problem-solving wealth distributed by non-market channels) is focused on the activities of citizens not of formal structures constituted by the state. Privately produced services-to-the-public are distributed by markets for a price as EVs thus EV = price. As the historian EP Thompson (1963) notes, prior to capitalism, goods and services were typically exchanged as UVs, (this constituted a *moral economy* founded on mutual obligations); where goods were sold the price was a just price equating to labour time expended in creating the goods. In short, prior to capitalist relations, UVs dominated EVs.

1.2 USE VALUES DOMINANT?

Here we present an argument, a line of reasoning that UVs may again be supplanting EVs as the dominant mode of goods and services production and distribution. We leave to a future paper the marshalling of detailed empirical data in support of this proposition. Figure 1 is an indicative example of the *prima facie* case – taking the example of the UK – of how UVs might be considered dominant.

1.2.1 GDP A CONTESTED CONCEPT

Although popularly used, GDP is a contested and ideologically-charged concept. When first proposing GDP calculation Kuznets' (1946) suggestion of measuring welfare not output was dismissed and since then the value of public services features as a negative rather than a positive. Report on French GDP measurement (Wikipedia, 2021) concluded that GDP is a socially-constructed fiction, privileging, as Coyle (2014) notes, private sector activity above that of the public sector. Mazzucato (2018) queries why shareholder value takes precedence over the value of nursing and Christophers (2013) queries why financial intermediation is a positive and care services a negative, and Haldane, Brennan and Madouros (2017) shows that many financial transactions are double-counted. If I hire a gardener the cost is GDP-positive, if I marry her, her work becomes GDP-neutral. More recently, Lazonick and Shin (2020) criticise as *legalised looting* hedge fund activities, such as share buybacks, that supposedly add to GDP and Birchall (2004) has criticised de-mutualisation of publicly-held organisations, one anomalous result of which is that the same activity magically becomes value-generative in GDP terms.

Other researchers attempt to measure the value of childcare (Suh and Folbre, 2016) and unpaid household activity (Gershuny and Sullivan, 2019). In short, our estimate of GDP composition may be no worse than "official" figures.

Piketty's (2020) point is that even though GDP measurement is ideological, the most important question is its maldistribution in what he terms *neo-proprietarian* capitalism. Inequitable distribution of GDP, Standing (2016) suggests, arises from monopoly rents on historic intellectual property. Christophers (2018) says the

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privatisation of public assets (10% of total landmass since 1979 sold) adds inequality and Kallis (2018) draws attention to the environmental costs of profit-seeking activities as adding inequalities.

1.2.2 THE VALUE COMPOSITION OF GDP: UK EXAMPLE

Table 1

Indicative estimates of plausible UK GDP composition

Traded goods and services income	Untraded goods and services value estimates	Explanation
2,000		Projected GDP (likely to revise downwards as a result of virus lockdown)
1,800		Less 10% downward revision, allowing for virus lockdown
	-680	Public sector total spending at 34% of GDP
	-20	Voluntary sector 1% GDP contribution
	-1,260	Estimated value of household use-values (ONS estimates at 64% of GDP)
1,800	-1,960	Totals
90%	98%	Percentage of GDP as EVs and UVs

Note: All figures [£] billion and 2020 to 2021.

UK GDP is c£2,000 billion per year (ONS, 2020a), but is likely to contract by perhaps 15% as a result of the COVID-19 lockdown, with the private sector contributing 90% of this figure as EVs (Statista, 2020). £2,000 x 0.85 x 0.90 = £1,530 billion private sector GDP contribution. UVs excluded from GDP include £680 billion per year public sector spending (ONS, 2020b; Statista, 2020), and a 3S (2016) £200-billion of UVs contributed.

Household UV contribution is contested. Suh and Payne (2019) calculates the market replacement value of childcare work, core housework, household management and travel/shopping time at 25% of GDP, which Federici (2012) and Gibson-Graham's (2006) method says understates the household contribution of 63% of GDP. For sake of argument, we take a 43% mid-way figure of £860 billion per year, noting that already many women *are* paid for housework, however, as Wolf (2017) points out, not their *own* housework, but that of richer women successful in market-based relationships. Drawing attention to women acting as carers for the elderly, elements of what Federici (2012) calls a triple-shift go financially unrewarded; a situation likely to increase as Ermisch's (1990) predicted *Fewer Babies, Longer Lives* proves prescient. Federici (2012) and Hockschild (2013) call for more state support to household activity, including nursery care and family financial benefits nearer to a wage. Ironmonger (2004) and others identify a wide range of emotional care UVs not included in these figures, to which might also be added: (a) replacement capital equipment or household transport UVs, Parmar's (2017) research shows, also adds significant non-GDP UVs; (b) care of 8-million elders (Wincer, 2020); (c) co-created UVs benefiting the private sector services; and (d) many UVs created and

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distributed by religious and community groups and amongst family and friends. We make no claim to a rigorous computation, simply that there is a plausible case that UVs are now the dominant means of value production and distribution in the UK economy: a conclusion, which if plausible, has important implications for PM. Bridgeman et al. (2012) surveys these issues and agrees with Coyle (2014) that GDP is a fiction. For the purpose of this article we are exercising a fiction that privileges UVs leaving precise computation and other countries to further research.

There is no universally-applied method for calculating PV by Supreme Audit Institutions, Cordery and Hay (2019) note, suggesting that it is reasonable, for the sake of argument in the rest of this paper to assume that UVs are now the dominant form of value production and distribution in the UK and perhaps in other developed economic contexts for public services.

1.3 PUBLIC MANAGEMENT RESEARCH AND PUBIC VALUE: TO WHAT QUESTIONS IS PUBLIC VALUE THE ANSWER?

We have argued that the post-virus world can be a point of transformation for public services and that already a plausible case can be made that UVs and PV are the dominant form of value creation and distribution. This section relates these ideas to the body of PM research on PV. Table 2 summarises our analysis of existing literature, which is enormous (some 650 articles, in ten years). Often as Colon and Guerin-Schneider (2015) note, PV criticises new public management (NPM). Van der Wall et al. (2015) identifies 550 different PV concepts.

Our classification of PV research reflects our view that UV = PV. Gooberman and Hauptmeier (2019) use a three-way classification of PV debates: (a) Bozeman's (2002) social outcomes, (b) Moore's (1995) Public Managers-created value, and (c) Meynhardt's (2009, 2019) individual psychological values. As in the rest of the book of Lindgreen et al. (2019) they make no mention of PV co-creation or Vargo and Lusch's (2008) service-dominant logic and confine their view of PV to that created by the publicly-funded public sector. Jorgsen and Bozeman's (2007) classification of PV is also restricted to the publicly-funded public sector. It confuses value and values: for example, under the heading "Public Value is not Governmental" they go onto speak of the values held by non-Government agents. They make no mention of co-creation or of value created by the public outside for the formal public sector. The three thematic approaches suggested by Bozeman and Johnson (2014: 62), i.e., policy application, normative criteria and improvement, usefully structures the literature from the policy perspective. According to Meynhardt (2019) PV research follows five strands: usefulness of operations, profitability/cost, ethics, political acceptability and user experiences.

Our trawl of literature, which is not systematic, from a PV-creation and economy stance resulted in the three major perspectives shown in table 2: marketing, co-creation and engagement and PV-management, which we break down into thirteen sub-themes.

To summarise our findings, all the literature allots a narrow footprint to PV as arising from formal public agencies and does not, as we argue it should, include UV production and distribution. The literature relates PV passively to economic context whereas we will show PV can spur unorthodox new thinking around the PV/economy interrelationship.

1.3.1 VALUES-TO-VALUE

For Moore (2005), Benington (2009) and Benington and Moore (2011) PV is a cost-benefit justification of publicly funded services; managers are responsible for improving PV. As the discussion above reveals, our concept of PV has the wider scope of UV services-to-the-public, including public services, and non-market household, voluntary organisation and caring activities: unpaid and paid. Our notion of value also differs from Moore and Benington for whom value is commensurate with private sector offers – it is financially comparative. Our starting point is that UVs constitute value, often only notionally comparable with market prices, since they are produced and distributed using non-market modes: we analyse PV from a different epistemological starting point.

Table 2

Key themes in PM research relating to PV

PM PV themes	Sub-themes	Authors
(1) Values to value: the marketing perspective		
Subjective user-satisfaction measurement	Value alternative to NPM	Moore (2005); Benington (2009),
	Normative, metaphoric alternative to price and efficiency (NPM)	Vargo and Lusch (2008) paradigm switch (private sector)
	Subjective user-satisfaction, metrics and PV management	Stoker (2006); Behn (2001); Mulgan (2002)
Ranking values	Value situated: no consensus across time and space	Rutgers (2008); Kahneman and Tversky (1979)
		Sandel (2009) on justice; Milanovic (2016) needs/wants
Subjective and objective user-satisfaction measurement	PV solves users' problems using UVs: crossing all governances not confined to private or private sector; negotiated in each situation	Laitinen (2017)
		Cordery and Hay (2019); Tirronen et al. (2020)
(2) Cocreation: the engagement perspective		
User-led innovation frame	Social shaping of technology	Von Hippel (1988)
		Mackenzie and Wajcman (1985)
Production frame	PV a better frame for problem-solving than cocreation; collective value	Liebenstein (1966); Ostrom (1996); Connolly and Wall (2016)
New public governances	Public Service Dominant Logic	Osborne (2017)

PM PV themes	Sub-themes	Authors
(3) Public value management: the management perspective		
PVM paradigm	Manager at the centre driving change towards user needs	Normann (2002); Stoker (2006); Grönroos (2013)
Value-creating not only value-distributing state	Not bureaucratic, entrepreneurial	Mazzucato (2013); Inwin (2019)
Urban regime/change coalition	Localist new governances	Bardach (1998)
Localised interactions: value flow patterns create "soft" structures	Governance-as-legitimacy	Laclau (1990); Kinder et al. (2020)
"e" with everything: technology-led change	Technology-led change, e.g. AI	Cordella and Bonina 2012; Goldin and Katz's (2008); Kinder (2020a)

Source: Authors.

1.3.2 VALUES-TO-VALUE AS A NORMATIVE, METAPHORIC ALTERNATIVE TO NEW PUBLIC MANAGEMENT

Migrating public values into PV, as Roberts (1995) notes, is a general orientation, not associated with specific management techniques or metrics, whereas Stoker's (2006) public value management (PVM) makes the PV perspective managerialist. For example, Vargo and Lusch's (2008) marketing framework of service-dominant logic, which makes little mention of public services, invokes customer-value, yet lacks the detailed, pragmatic toolkit PVM offers. Ostrom (1990) anticipates that polycentricity will embed public values, again at a generic level, in her case as *collective goods*. She uses the term PV in a metaphoric sense, applying it to market and non-market services. Whiteside (2011) too views PV metaphorically. The managers of Denhardt and Denhardt (2000) are urged to "serve" by enhancing PV, although there is no prescripton of how they are to recognise it or measure achievement. As Aligica and Tarko (2013: 728) note, there is a body of PM literature in which *[t]he semantic ambiguity surrounding the concept of values is notorious: values as intuitions, values as cultural ideals, values as beliefs, values as generalised attributes, values as transcendental, values as naturalised.* We consider PV a practical problem-solving approach, measurable using objective and subjective criteria. Unlike Stoker we do not limit PV to the formal public sector or to evaluation by Public Managers.

1.3.3 VALUES-TO-VALUE: SUBJECTIVE USER-SATISFACTION MEASUREMENT

Since services are characterised by being experienced subjectively by users, the value of services for researchers such as Vargo and Lusch (2008) and Mulgan (2007) is relative to the individual user: a marketing satisfaction perspective. This leads Rhodes and Wanna (2007) to criticise the substitution of satisfaction data for problem-solving policy-making, Cordery and Hay's (2019) *just use* of authority. All public choice approaches to value, Aligica and Tarko (2013) argue, are light on theory and stronger on responsiveness to public expressions of subjective satisfaction. Our perspective is that PV cannot be reduced to psychological impressions – the starting

point of UVs is solving problems not public opinion. For example, opposition to replacing residential care by independent living (Kinder, 2003) scores low on psychological satisfaction but high on problem-solving.

1.3.4 VALUE-TO-VALUE: RANKING VALUES

Ranking of values is good sport for philosophers: for Sandel (2009), justice trumps equality, for Milanovic (2016), needs rank above wants. Bozeman (2007) argues values can act as standards against which PV is judged and Bozeman and Sarewitz (2011) suggest ranking values to evaluate research programmes. Since values only alter slowly, Omurgonulsen and Oktem (2009) argue, they can be used to rank rights, obligations, and principles of government. Value ranking is central to Kahneman and Tversky's (1979) decision-modelling and Mitchell and Carson's (1989) idea of evaluating public services using satisfaction surveys. Even when values are not consensually accepted, Jørgensen's (2009) Danish study argues that making value transparency helps public debate. Since value ranking varies between context and culture (Rutgers, 2008), no universally accepted ranking of values is likely to emerge; instead a situated valuing of wealth that resolves situated problems may help identify PV.

1.3.5 VALUES-TO-VALUE: SUBJECTIVE AND OBJECTIVE USER-SATISFACTION MEASUREMENT

For Benington (2011), PV embeds desirable values and is evaluated using combinations of subjective and objective metrics, (citing inputs, processes and outcomes), to establish how valued public services are and how valuable they are in solving problems. As Bryson, Crosby and Stone (2014) point out such a multidimensional approach can give more sophisticated information than price signalling from markets: they point to feedback giving innovation ideas and the build-up of trust. The Tirronen et al. (2020) application of this approach to user wellbeing in the integrated service hubs for elderly citizens living independently is an example. UVs, by definition, solve problems and therefore to some degree embody citizens' values; the careful identification of objective *and* subjective values may enable providers to amplify positive PVs and reduce value-negatives.

1.3.6 CO-CREATION AND PUBLIC SERVICE LOGIC

Customer value is the founding principle of marketing (Kotler, 1984). For services, another example is Vargo and Lusch's (2008) *value-in-use* that results from customer involvement in product design and/or delivery: customers co-create services. Their idea is to shift attention from *production to utilization, from product to process, from transaction to relationship* (2008: 151), suggesting a paradigm shift from a goods-dominant to a service-dominant logic in which *value is benefit* (Vargo and Lusch, 2014: 57). Their focus is marketing private sector goods: they make almost no reference to public services or PV. Osborne's (2017) public service dominant logic combines SDL with new public governances and a service-user orientation that frames public services through the lens of co-creation. This aligns with, though differs from, the views of Grönroos (2007) and Normann

(2002), who focus on management of service systems, which in turn they differentiate from public choice theory (Ostrom, 1996; Wensley and Moor, 2011). Our PV perspective allows a wider footprint for UV creation and does not regard co-creation as essential to its creation.

1.3.7 CO-CREATION PRODUCTION

For "left" communitarians co-creation is an exercise in shared responsibility and user involvement (Giddens, 1991; Alford, 2011); while "right" communitarians view co-creation as a means of reducing paid-for public provision (Brookshie and Cursey, 1987). Kelly, Mulgan and Muers (2002) insist PV means citizens must be *willing to give something up in return for it* – in the case of co-creation, their unpaid labour. Try and Radnor (2007) and Meynhardt (2009) insist that co-created PV improves service quality, leaving unanswered who pays for the cost of quality. In Leibenstein's (1966) terms, co-created PV reallocates cost and responsibility from public agency to citizen. Co-creation, as Laitinen, Stenvall and Kinder (2017) point out operates at different levels, varies between contextual trust, and has a multiplicity of meanings: user-led or use-influenced services.

1.3.8 PUBLIC VALUE MANAGEMENT

Stoker's (2006) PVM allocates pivotal agency to the Public Manager who filters co-creation ideas and opportunities; an idea close to Grönroos and Ojasalo (2004) and Grönroos and Voima (2013) notion that Public Managers listen, learn, and innovate, and also close to the primacy of leadership in Hartley et al. (2014). Crouch's (2011) PVM emphasises hybrid governance, echoing Ostrom's (1996) idea that polycentricity creates innovation. PVM seeks opportunities to enhance efficiency and effectiveness in network and hybrid governance, a localist perspective, which though Manager-centred may offer democratic renewal (Horner and Hutton, 2011) and localised governance-as-legitimacy (Kinder et al., 2020). Connolly and Wall (2016) take the wider view of value-capture. The PVM perspective links with Mazzucato's (2013) arguments on the entrepreneurial (value-adding, rather than value-distributive) state and Janeway's (2018) view that state agencies are important conduits of innovation. Our view of PV is wider than Stoker's (2006: 46), which restricts PV to the formal public sector.

1.3.9 e-WITH EVERYTHING

A final cross-cutting strand of PM research relevant to PV is closing the gap between science and technology (S&T), i.e. invention and innovation: increasing the pace of technology-led innovation in areas such as artificial intelligence (Kinder et al., 2020) and big data analytics (Kuoppakangas et al., 2019). Long-term e-service examples in HEC abound: healthcare pharmaceuticals, IT in education and alert, alarm and assistive technologies in care services. Technological innovation is accompanied by socio-ethical issues influenced by negotiations around the pace and direction of change, and the distribution of (dis)-benefits (Kinder, 2012). Too often "e" with everything, from digitalisation to machine learning is viewed as a panacea for problems in services to the public (Cordella and Bonina, 2012). Examples of AI abuse in

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O'Neil (2016), Brindle (2018) and Eubanks (2017) illustrate this point. Invariably the smartness is not in the technical networks and instead in how people adapt to new opportunities – Goldin and Katz's (2008) race between education and technology. S&T, then, can create and destroy PV.

To summarise, whereas Moore (1995) and most PV researchers call for market distributed value to feature more PV, our emphasis is on PV as UVs produced and distribution by non-market channels. Reconceptualising PV to include UVs created by households, the 3S and community associations *in addition to* the formal public sector opens new vistas in research on value, especially for PM research. Viewing PV as problem-solving, draws attention away from psychological satisfaction (Meynhardt, 2009; 2019) or deduced values (Rutger, 2020) and Stoker's (2006) manager-centricity. PM research on co-creation fails to address Leibenstein's (1966) criticism that co-creation simply shift costs. Sheikh and Yousafzai (2020) come close to our perspective; however, they view PV as mediated through the market, unlike our non-market view of PV production and distribution. Though Moore's (1995; Moore and Khargram, 2004; Moore, 2018) project of disentangling PV from neoliberalism's obsession with financial performance remains relevant, our UV = PV adopts the wider footprint for PV creation and non-market distribution. Following Moore's project, we now turn to unorthodox economic perspectives offering alternative approaches, remaining convinced that the lens of economics helps reveal the nature of PV in a post-virus world.

1.4 PUBLIC VALUE IN A POST-VIRUS CHANGING ECONOMY?

To take stock. Discussing PV in a post-virus world we have argued that, since UVs may now be the dominant form of value production and distribution, a transformation may be occurring in which neo-liberal market mediation ceases to dictate value relations and instead a new balance is negotiated between shareholder value and social values. We suggest that PV is best conceptualised more widely than through public agency-provided services, to include UVs created in households and the 3S. Our UV perspective includes UVs in PV: wealth that solves a problem for citizens. So far, our discussion has placed the public sector within an economic environment in which markets mediate value relations. But what if the post-virus economy alters? An economy supportive of public services and PV would seek arrangements other than neoliberal tax cuts and austerity that balanced state budgets rather than the economy. Similarly, Keynesian demand management, which balances budgets, over the economic cycle, has since Prime Minister Callaghan in 1976, and Presidents Mitterrand in 1983 and Clinton in 1996 reduced state spending. Perhaps the post-virus economy will adopt perspectives more supportive of the public sector and PV? Here we consider unorthodox economic perspectives – Regulation Theory and Modern Monetary Theory – showing how each favours PV and how the two can synthesise.

Regulation Theory (Aglietta, 1979; Boyer and Shread, 2001) envisages the economy in two parts: a regime of accumulation and a mode of regulation, arguing that

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when these parts are aligned the economy grows healthily (Streeck, 1992; Warde, 1994). Both the regime and mode of regulation organise people, markets, finance, knowledge, and the state in ways that match production and consumption. This model is similar to the development state (Johnson, 1982; Woo-Cummings, 1999) first witnessed in Japan, later in the "Asian Tigers" and now in (with quite different ideological content) in Socialism with Chinese Characteristics. Social reproduction in these economies features modes of regulation (consumption patterns, family, and education) aligned to the needs of the accumulation regime. Regulation is a major body of theory, the subtleties of which cannot be presented here. In table 3 and figure 1, the regulation approach is represented in (5) and (6), with (10) and (11) showing the mutually supportive relationship between the regime of accumulation and the mode of regulation. Note that environmental sustainability (12) is an essential ingredient of this perspective (we discuss the Green New Deal below), which is a meta-level view of the economy in which public services play an essential part. The model recognises that without PVs in HEC and public services supportive of production and consumption, the economy could not function – value produced in families is centrally important. The unorthodox Regulation approach is one example of unorthodox alternatives to neoliberalism and Keynesianism that might guide the post-virus economy, placing PV as a central variable.

A second unorthodox alternative to neoliberalism and Keynesianism is Modern Monetary Theory (MMT; Mitchell, 2020; Kelton, 2020). Its central idea is that an economy can adopt the goal of full-employment, including a Jobs Guarantee, financing this if necessary, by a permanent deficit, available to countries that issue their own fiat currency (not convertible to precious metal). MMT's insight is that governments are unlike households; they do not save-to-spend; instead, governments spend and then if necessary, tax and borrow, provided they are currency issuers. By spending (on Job Guarantee or HEC employment or boosting aggregate demand), MMT raises overall output by avoiding the waste of unemployment, which lowers output. Where international trade and the private sector are in surplus (paying taxes and funding Government borrowing), Government have no need to deficit-finance. Where the private sector is in deficit, Government spending boosts economic activity. Since a currency-issuing state can never go bankrupt, the Government is able to deficit-finance in the long-term, balancing the economy, as Japan has done for thirty-years, and not the Government budget. Unlike Keynesians, MMT has no need to balance budgets by cutting spending over the period of an economic cycle. At the centre of table 3 are three sectors of the economy: (1) public, (2) private, and (3) international trade. These interrelate (8) and (9) and where private and international trade are insufficient to provide full employment (7) the state deficit-finances. It does this not by borrowing and taxing, but simply by the Treasury spending via the Central Bank. The state uses targeted fiscal policy (taxes) to manage inflation (if the private sector overheats) and to pursue progressive taxation, perhaps of the sort envisaged by Piketty (2013, 2020). Note that like Regulation Theory, MMT at (12) too pursues full employment within the confines of a sustainable environment by implementing the Green

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New Deal, i.e. state-led and enabled "greening" of the economy as a new socio-technical growth paradigm. MMT views the economy as flows and stocks of income and capital. The basic model is: Gross National Product is made up of consumption (C) plus investment (I), plus government spending (G), plus the balance of trade (X-exports less M-imports), plus net receipts from financial investment internationally (FNI). GNP balance at full employment means all labour resources are being used; there is no wasteful unemployment.

$$GNP=C+I+G+(X-M)+FNI$$

Regulation Theory and MMT literature do not themselves envisage a synthesis, which is presented here to illustrate those alternatives to neoliberalist and Keynesian economic management are possible in a post-virus world. Such a synthesis would view public services as central to the well-functioning of the economy and society and not parasitical; and able to support expanded HEC employment and maximise PV, for example using a Jobs Guarantee to validate and support UV creation in households and the 3S (CNBC, 2019).

There are widespread criticisms of MMT as a *magic money tree*. Epstein (2019) argues that only the US dollar is sufficiently strong to trade with a permanent deficit. His Keynesian view, that deficits need repaying over the economic cycle is echoed by Paul Krugman (2020a), who notes that persistent low-interest borrowing is unlikely. Monetarists reject MMT arguing that deficits cause inflation and inflation causes unemployment (the Phillips curve trade-off): they instead favour austerity and a balanced budget. Mitchell (2020) rejects these arguments and debate continues.

Table 3

Factors constituting a simplified economy

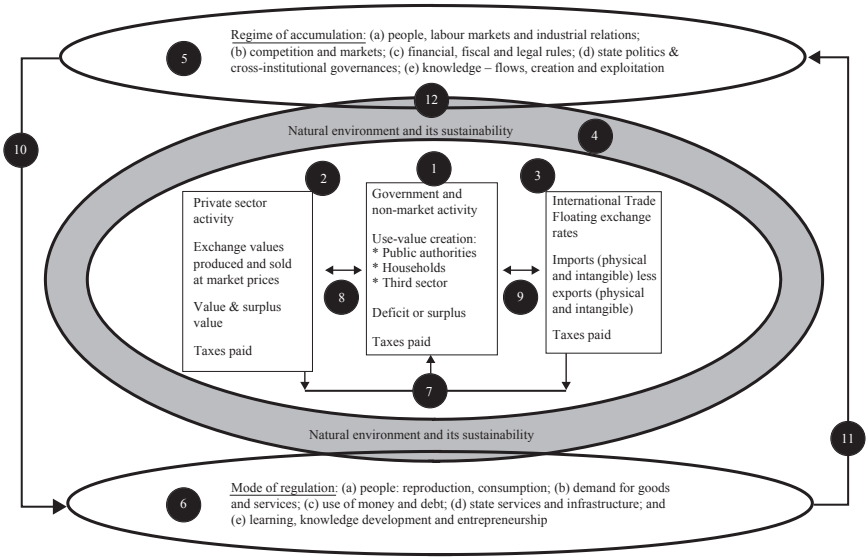
	Factor and function	Activity and relationships
1	Government provides public services and manages economy	Manages state spending level and deficit; sets interest rates, exchange rate band and employment target, aligns Treasury and Central Bank: manages aggregate-demand; spends before taxing and borrowing. Pays taxes and interest to itself.
2	Private sector invests, produces sells to accumulate profit; some PPPs and supply to public sector	Invests, employs and sells to suit profit-making at times leaving deficit state can fill be creating aggregate-demand that stimulates investment and economic activity. Pays taxes to Government, purchases Treasury debt.
3	International trade sector balance of trade and payments	Overall international trade balance (goods and services) creating surplus or deficit of foreign currency; inward and outward capital investment
4	Natural environment major part of wellbeing and sustainable living	Quality of nature is/should be a constraint on economic activity and positive externalities; state control of negative externalities, such as carbon emissions, degrading and abuse

	Factor and function	Activity and relationships
5	Regime of accumulation: production of goods and services	Production, supply, 5-factors, e.g. different Fordist to post-Fordist and neoliberal; drivers: accumulation + dominant value relationships (EV or mixed and UV)
6	Mode of regulation: consumption of goods and services, provision of labour force and carers	Consumption, demand, market regulation, SCM internationally, ways we buy life-as-lived
7	Balance economy not budget	S(TAB) not TAB(S) BUT activity might be non-market; inflation danger (Mattick) state spend > productivity
8	State regulates markets, sets legal and fiscal regime, gathers taxes, manages aggregate-demand	Balance in economy; if growth by private sector stalls, need aggregate-D boost by public
9	Trades, goods, services and capital, including migration	State vies with MNCs to control international trade: tariffs, regulations, OFDI and IFDI; currency exposure; fiat currency
10	Alignment of mode regime with mode	Overall economy alignment: supply/demand; production/consumption: 5-factors in either side; complexity economics
11	Alignment of mode with regime	Misalignment = crisis (accumulation opportunities, including internationally); also, who pays price of crisis?
12	Mode and regime and nature	Nature; Burkett; > constraint, wellbeing and QWL

Source: Authors.

Figure 1

Simplified economy model showing regulation theory alignment between regime of accumulation and mode of regulation



Source: Authors.

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We have shown that unorthodox alternatives to neoliberal and Keynesian approaches to economic management exist and some, such as Regulation Theory and MMT provide much more favourable contexts for public services. We now turn to how in a post-virus world these approaches could reshape public policies and services.

2 POST-VIRUS PUBLIC VALUE AND PUBLIC POLICIES

Having discussed PV in a post-virus world, a post-virus public sector and the post-virus economic context we now have a set of conceptual instruments in place to discuss post-virus PV from the viewpoint of *policy value* (Inwin, 2019) in four high-level policy areas: full employment and the job guarantee; GND; HEC, and wealth taxes.

2.1 POST-VIRUS FULL EMPLOYMENT

Unemployment wastes human life resulting in socio-psychological disorders and leaves unmet PVs much in demand, lowering output. Current issues include precariat fragile low-waged jobs (Standing, 2016), low incomes (Avent, 2017) and dire predictions of technological unemployment (McAfee and Brynjolfsson, 2014) weakening aggregate demand. Jansson (2013) proposes meeting PV demands by expanding HEC employment and training, while acknowledging opposition from neoliberals who campaign for a smaller state and lower taxes (Winters, 2011; Mayer, 2016) and recently for competitive national economies, as opposed to globalisation (Slobodian, 2018). Amongst Keynesians, Galbraith expresses a *culture of contentment* fear against raising taxes to fund state spending. In terms of the model in table 1, HEC expansion is necessary, since only an educated and healthy population can support continued science-based innovations and an expanding service sector.

One proposal is universal basic income (UBI) (Sen, 1985; Haagh, 2019; Van Parijs and Vanderborght, 2020), the cost of which varies given diverse current levels of welfare support. UBI claims to offer social inclusion/dignity, labour mobility, life-long learning, and increased participation in 3S PV creation, associating UBI with universal basic services (UBS; Coote and Percy, 2020). UBI is paid to the individual and is subject to the criticism of subsidising low wages. Alternative, MMT's proposed Job Guarantee can include an expansion of HEC employment and training implemented by local government; it includes training in sectors likely to result in future private sector employment (Tcherneva, 2012), with the wage at a living wage level, effectively pulling minimum wages upwards (Paul, Darity and Hamilton, 2018). MMT argues that full employment maximises an economy's output by eradicating unemployment, with a multiplier-effect of aggregate demand for private sector goods (Mitchell and Fazi, 2017).

In summary, an alternative narrative to right-populism might begin with a (MMT) jobs guarantee based on HEC expansion and wave of "green" socio-technical paradigm growth and trade. Such a scenario implies a new social mode of

regulation based on reduced inequality and exclusion, providing dignity and well-being especially for otherwise unemployed citizens. It also adds PV, supporting new ways of creating (and computing) value. Our point is that these arguments should be acknowledged and are best framed from a perspective of UVs now dominating value production and distribution.

2.2 WEALTH TAX

A *Regulation* economy invests heavily in people and knowledge, embracing technological advances requiring knowledge workers. The tax-take from such an economy may result (table 1) in inflation, overheating the private sector. MMT theory sequences spend, then tax and borrow in contrast to the Keynesian tax and borrow, then spend. Instead of revenue-raising, MMT envisages targeted taxation to control aggregate demand and achieve more equal wealth distribution. This aims for a lower Gini index of inequality that Atkinson (2015) correlates with higher economic performance. Post-virus austerity programmes, as advocated by neo-liberal economists, including developing economies (Ilyambo and Kaulihowa, 2020) would act as a negative multiplier and lead to depression and falling asset prices.

Piketty (2013), noting the historically high growth rates by western economies 1945-73 at a time when the top rate of income tax averaged 90%, famously argues that since 1973 $r > g$ i.e. returns to capital have exceeded economic growth. Like Bauman (2013), Piketty (2020) rejects trickle-down wealth creation arguments incentivising billionaires to invest and instead proposes an annual 5% wealth tax on assets above €2-billion, the proceed of which are to go (in our terms) to UVs. These arguments gain support from non-MMT economists such as Milanovic (2016), Eubanks (2017), Crouch (2020) and Paul Krugman (2020). Piketty's colleague Zucman (2015) argues that the EU Tax Directive is failing, because of EU-allowed tax shelters. For example, the up to $2.3-trillion held in Switzerland, mostly owned by Europeans exposed by Shaxson (2016) in *Treasure Islands*. Delong (2017) suggests imitating Norway's public asset register as a first step.

Whereas US legislators periodically cut taxes and then pursue balanced budgets by cutting spending on public services, MMT proposes spending to expand services followed by fiscal policies to stem inflation and equalise wealth distribution. Maximising PV instead of shareholder value is an argument of high resonance in the post-virus world in which the results of neoliberalism – exploitative value chains, rising inequality, and social exclusion – are increasingly being challenged. So too, is impact of neoliberalism on our natural heritage and living conditions.

2.3 THE GREEN NEW DEAL

Absolute de-coupling resource use and economic activity now appears essential if global warming and environmental degrading are to be avoided, according to Monbiot (2015). The limits to growth Hirsch (1976) and Schumaker (1985) predicted have been reached. Leaving resource exploitation to individual companies is no longer an option since shareholder value maximisation conflicts with

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environmental PV costs. De-coupling would entail a fundamental paradigm shift in how environmental sustainability issues are approached. Re-focusing activity on UVs is central to important debates on environmental issues. How much can the natural environment be utilised, while maintaining its sustainability? Also, natural objects only gain value (UV or EV) when worked upon by labour, can the idea of natural capital as a UV be measured and balanced against private capital accumulation which often deplete natural capital?

Mitchell (2020) outline a GND plan to create a non-carbon, sustainable economy over perhaps ten-years, using deficit-funding to radically alter the economy: private, public and international sectors – while at the same time addressing inequality using the Job Guarantee and progressive taxation. This aligns with the urgency advocated by Greta Thunberg (2019) and the Stern Report (2006), Klein (2019) and Kolbert's (2011) *Anthropocene extinction* warning.

Much of the capital and labour resources a GND needs are in the private sector, which would be mobilised behind the GND plan using Government planning and funding. In some cases, the plan might involve state ownership, though leveraging private investment is preferred. Problem areas, such as big oil's assets and infrastructure may require state ownership of old assets, while diversifying. GND promoters draw parallels with arms conversion after 1945. Reducing military spending and arms manufacturing is part of the GND, shifting resources from destructive to productive use, for example, in HEC sectors. The GND envisages close partnership with developing countries as food and raw material supply chains alter. GND means major retraining of human capital. In summary, the GND envisages a massive deficit-funded transformation of the economy using public-private partnering; a fundamental refocusing of market incentives and international relations.

Raey (2009) offers a slower, market-led alternative to MMT's GND. Others favour the more radical policy of de-growth (Kallis, 2018; Kurz, 2019) involving static or falling living standards. Dietz and O'Neill (2013) challenge the idea that economic innovation is always beneficial and calls for a steady-state economy, abandoning carbon-based industries such as airlines and oil.

Mitchell and Fazi (2017) note that an effective GDN necessitates a significant increase in planning. They proceed without a critical analysis of post-war nationalisation, French state planning or the 1930s theoretical debate on planning involving Von Mises and later Hayek against Hilferding, Lange and Dobbs. As Cottrell and Cockshott (1993) note, major companies now employ sophisticated planning techniques, often using AI, without the economic meltdown Von Mises et al. predict from abandoning market signalling (Barbrook, 2017). Social acceptance of GND planning needs to closely engage citizens, involve companies with expertise, learn lessons from the early work of Kantorovich (1939), Beer's projects in China (Beer, 1979; Medina, 2011) and from the Asian development state experiences (Chang, 1994). In short, a radical GND can align with MMT proposals for a Job Guarantee with state-led planning.

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3 POST-VIRUS PUBLIC MANAGEMENT AND PUBLIC VALUE: CONCLUSIONS

3.1 VALUE OF THE DISCUSSION

How revelatory for thinking about PV in the post-virus world is the marriage of PM and economics; in particular, the notion that UVs may be the predominant manner of value distribution?

According to the WHO (2020), there will be no post-virus economy in the sense that viruses are an integral part of economic activity as currently constituted: we have suffered 70 virus epidemics in the last 20-years and 300 new pathogens threaten zoonotic transmission in years to come. Discussing the bio-pharmaceutical industry, Pisano (2011) makes the point big pharma categorises many diseases as *difficult to research*, by which it means *unprofitable to research*. Although finding vaccines is a social (UV) priority, as the *Economist* (25 June 2020) notes, it has not been a priority of for-profit pharmaceutical companies, despite them benefitting from publicly-funded basic research. Are we to rely on the decisions of billionaire philanthropists for such research when their manner of wealth accumulation has been ethically questionable, as Mayer (2016) and Wahhab (2016) argue? This issue vividly illustrates the central issue of PV: the priority given to societal UVs relative to the economy's accumulation and profit driver? To embed ideas such as these, PM and social policy theorists might begin by accepting that "economy" is not background with PM as a passive recipient; instead, for PM to enlarge PV, PM research needs to give more foreground attention to economics, heeding where the market/society boundary is drawn.

Mark Moore's project has successfully placed PV on an agenda previously dominated by neoliberal economics, which mediates public service activities via the market. Neoliberal hegemonic market-dominance continues to reinvent itself as the dominant discourse, framing PV decisions around metaphors such as the economy is like a household; can society afford it; we can't pass on intergenerational debt, and the private sector has to make money before the public sector can spend it. Since Keynesianism degenerates into public spending cuts, if the economy is to serve society, instead of society being subjugated to the economy, PM research needs a clearer vision of PV than we find in some of the literature discussed above. PM needs to challenge the economic environment, highlighting alternatives to neoliberalism, such as Regulation Theory and MMT, Jansson's ideas for HEC expansion, and the notion that PV can be created outside the formal public sector and distributed as UVs using non-market channels. The balance between for-profit and UV activity will vary between countries. For example, some states will accept *capitalism without capital* (Haskel and Westlake, 2018) exploiting the public infrastructure; other countries, such as China are unlikely to deviate from their successful development state model (Lewin et al., 2016). Our point is that there are alternatives to the neoliberal model.

Like Piketty's (2020) radical proposals on progressive taxation, the policy agendas of Regulation Theory and MMT will only be implemented if progressive PM policy-makers achieve power; an unlikely prospect for countries such as the US

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and UK and less so for federations such as the EU with the Central Bank constituted with neoliberal goals. For complexity theorists, such as Arthur (2015) the hope is that ecosystems will allow bottom-up change drivers to take hold. Cordery and Hay (2019) point out that bottom-up change, enjoying the legitimacy of wide acceptance may deliver more radical change than top-down disruptive policies.

There is no inevitability of progress and especially so in the post-virus world since economies will emerge burdened with debt, advised by neoliberals and Keynesians to pay down debt stock and reduce debt flows (current spending). Instead of HEC being expanded, will further areas of public activity be privatised, in place of the new governances targeting new effective models of public services hoped for Osborne et al. (1996, 2005, 2017)?

Yet, oligarchic power (Winters, 2011) and rentier monopoly profits by big tech companies (Standing, 2016) and the associated rising inequality (Boushey, Delong and Steinbaum, 2017; Piketty, 2020) remain strong. Jansson (2013) makes the case for an expansion of health, education, and care (HEC) services, in response to demographic change, a call that a UV economy could answer. One argument against UV planning in the past was the need for market price signals to direct resources efficiently, it may be that AI capabilities now overcome this information deficit and can help plan the UV aspect of GND implementation. Castells (2017) in *Another Economy is Possible* brings some of these economic ideas together. If, as economists propose, the post-virus economy is a turning point, in which way will it turn? The debate includes Streeck's (2017) six ways in which capitalism might end, and Castells' (2017) call for an anti-capitalist coalition.

3.2 THEORY CONCLUSIONS

In discussing post-virus PM, our article makes three contributions to the economics of PV in PM: (a) PV production/distribution does not have to be market mediated since UVs are inherently valuable as problem-solving wealth; (b) PV are created in a wider footprint than formal public services; and (c) PM research can benefit from widening its epistemic community to include economics in interdisciplinary research.

Like Moore (1995), we reject the idea that all valuable service outcomes are either best delivered by the market or judged against market efficiency standards. Our difference with Moore and subsequent PV theorists is around the extent to which UVs, without market value, are currently being produced and distributed without market mediation: UVs have what Inwin terms *policy value*. Migrating values to value (marketing literature in table 2) illustrates how the values of PV mediated via the market or produced by the formal public sector can embody the values of the public, how marketing literature underplays the UVs the public creates in households, the 3S and community associations, not to mention the black economy. We argue that UVs are wealth that solves citizens' problems: PV = UV = wealth. Figure 1 also summarises our response to co-creation research on PV: our argument that

single-shot co-creation case studies while a valid research technique, may suffer from confirmation bias and neglects the much more significant stock and flow of value created as UVs. PVM too disregards the UVs produced by the public, focusing instead on the priorities and evaluations of the formal public sector.

We offer a new definition of PV and a new (wider) footprint of where and by whom it is created. We redefine PV to include UVs produced and distributed outside the formal public sector and unmediated by the market. These UVs fall into our definition of PV as wealth that solves a problem for citizens. We agree with Espeland and Stevens (1988), who argue that from the perspective of citizens, (though not the market or the formal public sector), UVs are inherently valuable: they solve problems. An incidental, not essential aspect of our contribution, argues that in the UK's case, UVs are now the dominant form of value production and distribution: an important argument in countering the neoliberal ideology of the predominance and pre-eminence of market relations.

Our third contribution acknowledges that PM though a hybrid discipline undertakes little interdisciplinary research involving macroeconomics. More frequent featuring of economics in the PM epistemic community is important since PM theory and policy constantly rubs against the economic environment. We make three points:

- PM cannot be neutral about economic policy. Moore's project was to challenge the neoliberal premise that only financial performance criteria are relevant. As Plehew, Slobodian and Mirowski (2020) show, left unchallenged neoliberalism reinvents itself; market fundamentalism is embedded in universities and international organisations. If PM requires an alternative economic policy, it must argue for it, following Connolly and Wall's (2016) argument that value cannot be reduced to financial computations.
- Economists too challenge neoliberal reductionism of all value to monetary value: Shackle (1972), Beinhocker (2007), Bronk (2009), Bookstabler (2017), and Tooze (2018) are examples. Challenging the claim that (neoliberal) economics is an incommensurably separated epistemic community from PM links with significant bodies of research favouring a quite different environment within which public services can operate and value be computed. Currently ideas from Baumol (2012) and others mythologise public services as non-productive and characterised by low productivity. PM has a responsibility to challenge these unwelcome incursions. The alternative is to vacate the field to neoliberals and passively accept that the economic environment is exogenously created by powers beyond the influence of PM theorists.
- Keynes' (1936) accusations against monetary economists included the fallacy of composition: aggregating firm-level logic to the whole economy. As Bozeman (2007) notes, PM too must be wary of concluding from single-shot case studies of co-creation that this is how an aggregated service might be run. General policy preferences, which may include full-employment and greater income equity will not be deduced from micro-level cases. Instead,

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they require the marriage between PM and economics this paper has promoted. The UV approach to PV views agency firmly at the point where citizens resolve their problem: deep levels of co-creation are not essential, nor is the Public Manager the central agent of production as Ostrom (1973) and Moore (2005) envisage.

3.3 PRACTICE/POLICY

Headline policies shown as desirable from our discussion include Jansson's (2013) expansion of HEC (health, education and care) services and employment; MMT's job guarantee for full-employment (Mitchell, 2020), Piketty's (2020) progressive taxes and the GND. Close examination of these policies reveals that only a sustained implementation period (say 10 years) would be necessary, radically altering not only economic policy but also the organisation, structure and mindset of public services. The danger is what Rosa Luxemburg criticised as a mini-max programme meaning minor change today, longer-term change so ambitious and ill-defined that it is never reached. For example, transition to MMT's policies (GND, Jobs and equity) requires a close working relationship between the Central Bank and Government Treasury, ending central bank independence and calling for new accountability arrangements. The jobs guarantee calls for locally planned and implemented expansion of health, education and care services, employment, and training: all major tasks.

PV creation using these policies and facilitating the UVs contributing to PV from our wider PV footprint are changes needing a lengthy period of stability and shared future vision, more often seen in the Asian development states than western market societies (perhaps with the Nordic exception). Success across election cycles can only be conceived if a clear and brave vision of social change captures society's trust: trust sufficiently deep to withstand trouble in the form of an unsupportive media. Pettit's (2017) notion of active republican citizenship becomes relevant in societies many of which are currently more inclined to populism and the passive citizenship resulting from deprivation and despair, instead of challenging the socially-destructive narrative of neoliberalism. We note also that neoliberal agents have successfully sidelined interventionist policies except those favouring profitable markets. Transition to MMT-type post-virus PV policies will be resisted and instead of being posited as an ideological alternative will perhaps be most successfully posited in terms of Dewey's (1939) *pragmatic idealism*, for example the social case for HEC jobs and services: redrawing the boundary of where UVs begin and EVs end. If a UV approach is chosen, for example technologically-assisted independent living with appropriate ambient services, a combined top-down and bottom-up planning and implementation may offer the line of least resistance. We stress, however, that market alternatives always exist such as (in this case) insurance-based private care with a minimalist state backup. Osborne's (2010) call for new governances and new service models is useful and perhaps especially attractive in the area of care where in some countries professionals have become more used to responding to austerity than to the challenges of HEC expansion. Continuing with the idea of radical new care models, already some local authorities are successfully

deploying AI-based technologies to personalise care and offer ambient services, especially targeting, as Svendsen (2018) notes, the lonely-elderly, remembering that in Whiteside's (2011) *hierarchies of care* mental health can come low. We also note Brown's (2017) research on walled-welfare – the idea that high quality services for all can exacerbate tensions in relation to migrants.

As a contribution to debate, the article raises questions, without offering empirical support; it looks forward to arguments and the clarification of ideas, about the points where PV and PM and economics meet.

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Public value and public services in the post-virus economy

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Abstract

This paper provides an overview of different inheritance tax regimes in selected European countries and the United States. We show that in the majority of countries the tax rate is related to the relationship between testator and the beneficiary as well as the value of the inherited assets. In most countries the transfer of wealth within families is treated preferentially (lower tax rates, tax exemptions and reliefs). This is particularly the case for business assets and family homes. The analysis further discusses the features and effects of inheritance tax regimes, which include behavioural responses of individuals and different distributional effects of an inheritance tax. Although the actual revenues of inheritance taxation are quite low in the selected countries, some indicators point to higher revenue potentials in the future. An appropriate design for inheritance taxation could further help to decelerate the increase in wealth inequality.

Keywords: inheritance taxation, tax regimes, wealth inequality

1 INTRODUCTION

Property taxation is currently an important topic in both politics and economics. The taxation of wealth transfers over generations is particularly controversial. In assessing inheritance taxation, opposition to any such tax is provided by those who prioritise liberal property rights. However, the transfer of wealth may foster wealth inequality, resulting in rising inequality of opportunities. The latter argument provides support for inheritance taxation. In discussing the basic concepts of the tax, Marterbauer and Schürz (2007) distinguish, *inter alia*, among the equality, justice, and family principles. Following the equality principle, the taxation of inheritance should diminish the intergenerational transmission of inequality and thus at least reduce the growth in the concentration of wealth in family dynasties and upper classes. An inheritance tax thus aspires to achieve a higher level of equality of opportunity within a society. The justice principle suggests that affluent individuals should contribute more to support poorer groups in the society, because they have a higher ability to pay. In contrast, the family principle emphasises the claim of the family in relation to individual property and therefore also its transfer via bequest. The wealth of a deceased individual is considered to be the property of the family and the government is not entitled to intervene. The first two arguments are obviously in opposition to the last in a discussion on the implementation of taxation on inheritance.

The role of family is particularly important for the general attitude towards inheritance taxation (see Fessler and Schürz, 2020). As family values seem to play a dominant role for inheritances and in discussions on its taxation, inheritance taxes are rather unpopular. Fessler and Schürz (2020) claim that even though a relatively large proportion of the Austrian population is in favour of a wealth tax, only a few show any preference for an inheritance tax. Bastani and Waldenström (2021) found that individuals tend not to perceive the part played by inherited wealth in inequality of opportunities. More information about this role increases support for an inheritance tax. *The Economist* (2017) argues that the negative perception of

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inheritance taxation is related to the secular rise of home-ownership in many countries. Individuals tend to see a higher probability of having to bear the tax.

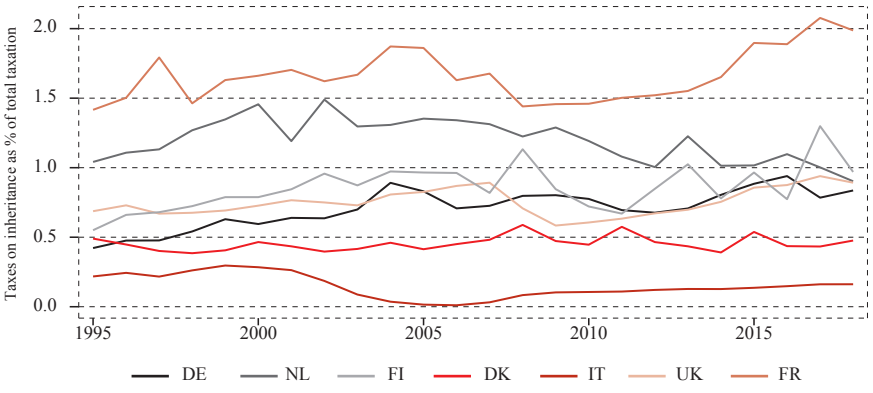
Against this background, it is surprising that international organisations, such as the OECD and the IMF, have recently called for higher taxation on the wealthy and for shifting from taxes on labour to higher taxes on wealth. By doing so, the potential role of an inheritance tax has been emphasised (see OECD, 2018). The taxation of intergenerational wealth transfers is expected to be less distortive than taxes on labour which would result in beneficial effects for economic growth (see OECD, 2019; Bastani and Waldenström, 2020). This supports the use of an inheritance tax from an efficiency perspective.

Bequests were taxed in all EU member states in 2018, except for Sweden, Latvia, Estonia, Austria, Cyprus and Malta. As outlined by Iara (2015), the design of inheritance taxes across European countries is heterogeneous. Although there are some similarities across countries in the general concept of the tax, we can find differences concerning tax rates and exemptions. In many countries, even when tax rates are progressive, the family principle is still partly considered in the design of inheritance taxation, i.e. close family members are granted preferential treatment.

Differences across countries become also visible when we look at the inheritance taxes as percentage of total taxation in selected European countries in figure 1. As can be seen, the share of inheritance taxes ranges between 0 and 2% of total taxation. The highest shares can be found in France and the Netherlands, and the lowest in Italy and Denmark.

Figure 1

Share of inheritance taxes (as % of total taxation), 1995-2018



Source: European Commission, DG Taxation and Customs Union, based on Eurostat data; own calculation and illustration.

In the recent past, many European countries have conducted changes and reforms with respect to inheritance taxation. Austria abolished inheritance taxation in 2008. In addition, inheritance taxation was suspended from 2001 to 2006 in Italy.

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Most recently, tax reforms have taken place in Germany and the United Kingdom. Reforms in Germany, enacted in 2017, adapted its existing tax exemptions and reliefs for family businesses. In the United Kingdom, additional exemptions for intergenerational transfer within the family were been introduced. Beyond that, Republicans in the United States have a tax reform plan aimed at abolishing the taxation of inheritances by 2025 (see *The Economist*, 2017).

This article contributes to the literature by providing an overview of different inheritance tax systems based on a set of selected European countries as well as the US, and by identifying different economic effects emanating from these systems. In doing so, the present article addresses the question of how different inheritance tax systems can affect wealth inequality and which elements of inheritance taxation potentially result in distortionary effects. By drawing on theoretical and empirical research, I discuss implications for the design of the inheritance tax. The analysis predominantly focuses on the current design of inheritance tax systems. For an historical approach to explore the development of inheritance taxation see Beckert (2008) and Henrekson and Waldenström (2016).

I particularly focus on the EU countries Germany, Denmark, Finland, France, Italy, the Netherlands and the United Kingdom as well as on the United States. The selected countries are representative of different inheritance taxation systems.[1] Moreover, the analysis covers countries where there have recently been discussions on potential reforms of the inheritance taxation system (e.g. Germany and the United Kingdom).

The remainder of this article is as follows. Section 2 discusses the general features of inheritance tax regimes. In section 3, I evaluate the inheritance tax regimes based on a number of criteria. Finally, section 4 concludes.

2 GENERAL FEATURES OF INHERITANCE TAX REGIMES

In this section I address the main characteristics of inheritance tax systems across selected European countries and the US. In general, an inheritance tax can be characterised by the following items:

Basis of tax assessment
Is the tax imposed on the entire legacy or on each legatee separately?

Tax rate design
What are the determinants of the tax rate?

Exemptions & reliefs
What is the general design of exemptions?
- Specific groups of individuals
- Specific treatment of business assets
- Discrimination between asset types.

[1] For instance, a double progressivity in tax rates in Germany and the Netherlands; single progressivity in tax rates in the United States and a flat tax in the United Kingdom.

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2.1 BASIS OF TAX ASSESSMENT

The taxation of intergenerational transfers related to the death of a testator is typically called an inheritance tax. However, one can distinguish between an inheritance tax in the narrow sense and an estate tax in the general sense. In the former case the tax is conceived to be levied on the inheritor, whereas in the latter case the tax is levied on the estate itself (see Nass-Schmidt et al., 2011). An estate tax is common in Anglo-Saxon countries, whereas an inheritance tax in the narrow sense is applied in most European countries (see table 1). However, there are also countries with an inheritance tax composed of both concepts.

Table 1

Inheritance and estate taxes

Inheritance tax (in a narrow sense)	Estate tax
DE, DK[2)], NL, FI, FR, IT	DK[2)], UK, USA[1)]

Note: 1) The US applies an estate tax at the federal level. At the level of individual states, we however find both systems, estate and inheritance tax systems. In our analysis of the US regime we however only consider the federal estate tax. 2) Denmark applies both systems: an estate tax is combined with an inheritance tax (see more details below).

Source: Nass-Schmidt et al. (2011) & EY (2015); own illustration.

Germany, Finland, France, Italy and the Netherlands impose an inheritance tax in the narrow sense. The United Kingdom applies an estate tax, i.e. the tax is levied on the assets of the deceased person, although the tax is legally called "inheritance tax". Likewise, in the United States an estate tax is imposed on the deceased's estate upon death. Denmark applies both types of inheritance taxation. It levies a tax on the estate and a second one in particular cases (see below) on the individual inheritors.

2.2 TAX RATE DESIGN

In order to assess the effects of an inheritance tax, it is important to examine differences in the determinants of tax rates. The two major determinants of the tax rate represent the value of inherited assets as well as the relationship between the testator and the beneficiary. As illustrated in table 2, we can identify four country groups regarding the determinants of the tax rate design.

Table 2

Tax rate design

Country	Determinants of tax rates
IT, DK	Relationship between persons
US	Value of (total) inherited assets
DE, NL, FI, FR	Relationship between persons & value of inherited assets
UK	None (flat rate)

Note: Tax exemptions and reliefs are not considered in the determinants (see below).

Source: EY (2015; 2016; 2020); own illustration.

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In Italy and Denmark, the inheritance tax rate depends only on the relationship between the deceased and the recipient of the inherited wealth. In contrast, in the United States, the sole determinant for the inheritance tax rate is the value of the total inherited assets. In addition, in many countries like in Germany, Finland, France and the Netherlands, the tax rate applied depends on both determinants. In the United Kingdom, however, tax rates are irrespective of both which results in a flat rate.

Next, we explore how these two determinants shape the structure of the inheritance tax in the respective countries. According to the relationship between the deceased and the recipient of the inherited assets, we observe different tax classes. Table 3 shows the group of persons in the tax classes within the respective country. In the United States and the United Kingdom, we do not find any tax classes, because tax rates do not depend on the relationship between the deceased and the recipient. This is however different from tax exemptions and reliefs, as in both countries exemptions and reliefs are related to the kinship between the persons involved in the inheritance process (see more details below).

Table 3
Tax classes

Country	Class assignments
Germany	I: close relatives[1)] (incl. grand-/stepchildren), II: wider family (incl. siblings), III: others
Italy	I: close relatives (incl. grandchildren), II: siblings, III: other relatives (stepchildren), IV: others
Netherlands	I: close relatives, II: grandchildren, III: others
United Kingdom	–
Finland	I: close relatives (incl. grand-/stepchildren), II: all other cases
United States	–
France	I: ascendants and descendants, II: siblings, III: blood relatives (up to fourth degree), IV: others
Denmark	I: close relatives, II: others

Note: 1) close relatives comprise spouses (partner) and children.
Source: EY (2015; 2016; 2020); own illustration.

Table 4 provides, at a glance, inheritance tax rates applied in our country sample. As shown in table 3, the consideration of the relationship between persons allows for the definition of different tax classes. Next to that, the asset as a tax rate determinant implies the possibility of imposing a varying tax rate depending on the value of the inherited assets. In countries where both determinants are implemented, we find increasing average tax rates within and across tax classes. Obviously, closer relatives generally face a relatively lower tax rate. The treatment of spouse or partner, in particular, and of other direct relatives, reveals tax privileges. This implies higher marginal tax rates in higher tax classes. This is often referred to as "double progressivity". On the one hand there is a progressivity in the tax rates across the tax classes and on the other hand there is one within the respective classes. Thus, again not surprisingly, the extent of the progressivity in the tax rates

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is strongly related to the determinants of tax rates discussed above. As expected, we observe the lowest variation in the tax rates in the United Kingdom. In Denmark, the first tax class refers to the estate tax that is levied on the inherited wealth. When inheritors are not family members, an inheritance tax is imposed additionally on the inheritor, whereby the total tax rate then yields 36.25%. In contrast, family members have to pay only the estate tax of 15%.

Table 4

Tax rate groups

Country	Tax rates
Germany	Tax classes with different progressivity – I: 7-30%, II: 15%-43%, III: 30-50%
Italy[1)]	Tax classes with fixed rates – I: 4%, II: 6%, III: 6%, IV: 8%
Netherlands	Tax classes with different progressivity – I: 10%-20%, II: 18%-36%, III: 30%-40%
United Kingdom[2)]	40%
Finland	Tax classes with different progressivity – I: 7-19%, II: 19-33%
United States	Class with progressivity – 18-40%
France	Tax classes with different progressivity – I: 5-45%, II: 35-45%, III: 55%, IV: 60%
Denmark	Tax classes with fixed rates – I: 15%, II: 36.25%

Notes: 1) Class II contains tax-free amount tax, whereas class III does not have it. 2) The tax rate can be reduced in case of leaving 10% of estate to charity.

Source: EY (2015; 2016; 2020); own illustration.

2.3 EXEMPTIONS AND RELIEFS

Inheritance tax systems can also be classified according to their exemptions and reliefs. In principle, tax exemptions and reliefs allow the reduction of the tax base and subsequently the tax burden. This section addresses inheritance tax exemptions and reliefs with respect to specific groups of individuals and specific treatment of business assets, as well as discrimination between asset types.

2.3.1 SPECIFIC GROUPS OF INDIVIDUALS

Countries where the relationship between the testator and the beneficiary is considered in the design of the inheritance tax are generally characterised by a system of different tax-free thresholds. For example, in Germany we even find different tax-free amounts within these classes.

The pattern of the tax-free amounts corresponds largely to the structure of the tax classes in tables 3 and 4. The closer the relatives, the lower the tax rate and the higher the tax-free amounts. Furthermore, the tax-free amount is little or nothing when deceased and heir are not related. A common characteristic in nearly all our selected countries is that the spouse/partner can receive the inheritance tax-free. This is even the case in countries where the relationship between persons is actually not considered in the tax rate design, as in the United States and the United Kingdom. An exemption to this is Italy, where the spouse is not exempted from tax.

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However, individuals in the first tax class can make use of an exemption amount of EUR 1 million. In the United States and the United Kingdom, we find uniform tax-free amounts. As discussed above, however, there are additional tax-fee amounts for related heirs even in these countries. In the United States, the uniform tax amount covers wealth assets of USD 11 million and is called "unified tax credit"[2]. Beyond that, transfers to spouses can be entirely excepted from taxation. In the United Kingdom, the uniform tax-free amount is only £ 325,000, but can however be extended for close family members. Further special cases are Denmark, the Netherlands and Finland, where even the state can benefit from exemptions.

Table 5

General exemptions and reliefs

Country	Exemptions and reliefs
Germany	Different tax-free amounts within classes depending on degree of kinship, decreasing tax-free amounts across classes, family home for spouse as well as children and stepchildren
Netherlands	Different tax-free amounts depending on degree of kinship, special exemptions for disabled persons and the state
United Kingdom	Uniform tax-free amount additional tax-free amount for close family members transfer to spouse/civil partner is tax-free
Finland	Exemptions for the state and its institutions, special public employees (e.g. diplomats), exemption for spouse possible
United States	High tax-free amount, unlimited deduction for spouses that are US citizens, deduction for non-US citizen spouse limited
France	Different tax-free amount across tax classes, transfer to spouse is tax-free
Denmark	Exemption for transfers to spouse or an organisation of public utility as well as state
Italy	Different tax-free amounts across classes, no tax-exempt threshold for other relatives (stepchildren) and others (III & IV), special exemptions for disabled persons

Source: EY (2015; 2016; 2020); own illustration.

2.3.2 SPECIFIC TREATMENT OF BUSINESS ASSETS

The preferential treatment of family businesses and businesses in general is a debated central theme, and was so particularly in the discussion on the most recent reform of the German inheritance tax regime. The main argument for preferential treatment suggests that the taxation of such transfers may lead to liquidity problems of firms and subsequently to liquidations (see Bräutigam et al., 2017). Moreover, preferential treatment of (family) businesses may further foster firm-specific investments and allow a long-term planning and focus of the businesses (see Wiebe and Fetzer, 2015). Thus, it is beneficial for the economy to dampen the inheritance tax burden on (family) businesses (see Beznoska, Hentze and Stockhausen, 2020). In 23 out of 28 EU member states we find exemptions or special reliefs for intergenerational transfer between family and closely held businesses

[2] The unified tax credit was increased from USD 5 million to USD 11 million under President Donald Trump.

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upon death. The countries without an exemption or special relief are Bulgaria, Denmark, Luxembourg, Lithuania and Slovenia. Furthermore, the United States does not assign separate tax privileges to family or closely held businesses. This might be related to the generally high tax-free amount ("unified tax credit"). In some countries, the exemptions only refer to transfers of businesses where the prospective testator acts as an entrepreneur and/or the deceased must own the business a certain period of time before death. For example, the latter constitutes a prerequisite for tax relief in the United Kingdom. In addition, the inheritor needs to continue the business after the receipt at least for a specific period of time in some countries (e.g. Italy, Netherlands). Beyond that, tax exemptions and reliefs for businesses may principally favour a typical sort of legal form, insofar as family businesses as well as business partnerships are preferred as compared to corporate enterprises (see OECD, 2016). In general, the preferential treatment of businesses might be associated with strategic tax planning, as there is an incentive to convert non-business assets to business assets (see Beznoska, Hentze and Stockhausen, 2020) (see more details below).

In Germany, the exemptions with respect to business transfers are not restricted to a specific tax class and thus are independent of the relationship between testator and beneficiary. In general, these exemptions and tax reliefs are clearly aimed at supporting the continuity of the business across generations. Potential negative impacts of an inheritance tax on business activities are addressed by Astrachan and Tutterow (1996). They point to negative impacts on corporate investment decisions of inheritance taxation, which may limit entrepreneurial growth. Likewise, Brunetti (2006) explored the impact of the estate tax on business sales by using probate records for San Francisco. The estimation results suggest a positive effect of taxation on business sales. In contrast, Houben and Maiterth (2011) drew on data from German inheritance tax statistics as well as SOEP data and compared the German inheritance tax system with the former system with respect to privileges for bequeathed businesses. The former tax system generally allowed privileges to a lower extent. They concluded that there is no need for inheritance tax exemptions and reliefs for businesses in order to support the business continuation. Similarly, the German Bundesministerium der Finanzen (2011) argues that inheritance tax relief in Germany is designed improperly to protect businesses. In 2016, a tax reform took place in Germany concerning the intergenerational transfer of businesses. Stricter regulations for business transfers were enacted as well as the reduction of tax-free amounts in the case of enterprise values exceeding a certain threshold. However, the preferential treatment of family businesses is still criticised after the reform. The exemptions still constitute a complex system, in which discrimination among asset types prevails (see Brauns and Schuler, 2016).

2.3.3 DISCRIMINATION AMONG ASSET TYPES

Finally, we find discrimination among specific asset types. In this respect, the bequest of family homes receives a preferential tax treatment in some countries. For example, in the United Kingdom a high tax-free amount is deductible if the

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inherited family home is transferred to the children. Likewise, a higher tax-free amount for family homes is applied to relatives in class I in Germany. Specifically, the family house is completely tax-free for spouses/partners if they dwell in it. In addition, agricultural and forestry assets are treated preferentially with respect to inheritance taxation in some countries (e.g. Germany, France).

3 EVALUATION OF INHERITANCE TAX SYSTEMS

In order to compare systems of inheritance taxation, we need to evaluate the tax according to meaningful criteria. Brunner (2014) generally argues for criteria such as potential revenues, potential costs and distributional effects to evaluate an inheritance tax. In addition, Schratzenstaller (2013; 2015) suggests a list of evaluation criteria to assess and compare different property taxes. In the following we compare the inheritance tax regimes of our selection of countries applying the following criteria:

Individual's response to inheritance and inheritance taxation
Are there (un)favourable responses of individuals to the receipt of the inheritance as well as the imposition of the inheritance taxation? How do they occur in the different inheritance tax systems?

Distributional effects / Accuracy of taxation
What is the distributional impact of inheritance taxation? What are the differences concerning distributional effects among inheritance tax regimes across countries?

Actual tax revenue and potentials
How does the actual tax revenue differ among countries and what is the revenue potential of inheritance taxation?

3.1 INDIVIDUAL'S RESPONSE TO INHERITANCE TAXATION AND INHERITANCE

In general, an inheritance tax is regarded as growth-compatible. Since the time of the intergenerational transfer is generally unknown, individuals' reactions to an inheritance tax seem to be limited (see Arnold et al., 2011). However, responses in the individual's behaviour cannot be completely precluded. The literature distinguishes between responses in the behaviour of the prospective decedents and the heirs. In general, reactions might be changes in savings behaviour as well as in wealth accumulation behaviour. The tax might even result in the emigration of prospective testators and potential heirs (see Schratzenstaller, 2013). In this respect, Bakija and Slemond (2004) analysed migration behaviour of rich individuals due to changes in estate taxation, using data for the United States from 1965 to 1998. The results suggest that although there were some movements of rich to regions with lower estate taxes, the numbers were only small. They further underline negative net effects on tax revenues. The negative effect due to the tax reduction in a region could not be offset by the influx of richer individuals to this particular region. In a similar vein, Conway and Rork (2006) explored the

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migration responses of the elderly due to estate tax policies in the US. They do not find evidence that estate tax policies affect the migratory behaviour of the elderly.

3.1.1 POTENTIAL RESPONSES OF PROSPECTIVE DECEDENT ON INHERITANCE TAXATION

The response in the behaviour of the prospective decedent is mainly determined by the bequest motive (see Cremer and Pestieau, 2011). These behavioural responses are mostly modelled and analysed in a theoretical framework while empirical evidence is scarce (for an overview of analysis done, see Kopczuk, 2013b). Whether the disposition of an estate is related to a specific motive, such as altruism, the joy of giving or some strategic purpose, an inheritance tax is supposed to have an impact on the decedent's behaviour, potentially resulting in changes in consumption as well as saving behaviour (see Kopczuk and Slemrod, 2001). Since these motives are strongly focused on the family, we can expect stronger behavioural changes when the recipients are closer relatives. In this regard, lower tax rates as well as tax exemptions for close relatives could dampen such an effect (see Cremer and Pestieau, 2011). Thus, this relationship favours inheritance tax systems where the relationship between persons is considered.

Moreover, the behavioural responses of the prospective decedent might be related to tax planning in order to minimise and avoid a high tax burden. Such reactions can typically affect the timing and the value of the prospective inherited wealth. Tax planning is therefore likely to have repercussions on tax revenues (see Beznoska, Hentze and Stockhausen, 2020). Kopczuk (2007) investigated the behaviour of donors that suffered from a severe illness prior to death in the United States. He finds evidence for tax planning, as donors significantly reduced the value of the reported wealth in tax returns. Kopczuk and Slemond (2003) provide further support for the prevalence of tax planning by donors. In contrast, Sommer (2017) analysed wealth transfers by exploiting administrative data for Germany and did not find evidence for tax planning in the case of inheritances. Moreover, differences in taxes and exemptions between inheritance and inter-vivo gifts may provide an incentive to transfer wealth before death (e.g. see Sommer, 2017). Beznoska, Hentze and Stockhausen (2020) discuss the preferential treatment of inter-vivo gifts as opposed to inheritances in Germany. This also refers to transfers of family businesses (see below). Kopczuk (2007) however shows that wealthy individuals tend to prefer to hold their assets until death and are reluctant to transfer wealth while alive.

Under a tax system where the degree of the relationship between testator and their influences the actual tax burden, tax avoidance might be more common. As we have already discussed, the tax can be principally levied on the total property of the decedent or on the inherited assets received by individual recipients. Thus, testators could lower the tax burden by allocating the bequest to a larger number of recipients in the case of an inheritance tax in the narrow sense.

In addition, inheritance tax exemptions and reliefs for business assets may affect the behaviour of the prospective decedent. In this respect, tax privileges may

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divert investments towards certain business assets or influence the choice of the legal form of businesses, even though these options are less productive. Such inefficient tax planning activities can therefore cause a misallocation of capital. Furthermore, an inheritance tax privilege for family businesses may result in lower managerial quality, since the pool of potential managers is restricted to the managerial ability of family members (see Andrews and Westmore, 2014). Thus, tax privileges for family businesses are likely to result in lock-in effects which prevent the reallocation of capital (see OECD, 2016) and may induce biased investment decisions (see Bundesministerium der Finanzen, 2012).

3.1.2 POTENTIAL RESPONSES OF HEIRS TO PROSPECTIVE INHERITANCES

Furthermore, the literature discusses the potential behavioural responses of heirs to future inheritances. Not only the actual receipt, but even the expectation of an inheritance may already influence the behaviour of (potential) heirs.[3] The direct behavioural change of inheritance receipt is discussed by Holtz-Eakin, Joulfaian and Rosen (1993) pointing to reduced tax revenues due to the so-called "Carnegie effect". This describes the observable reduction in labour supply after the transfer, triggered by an increased capability to consume. There are three determinants for the magnitude of this effect: fixed costs of adjustment (i.e. cost for reduction in labour supply), age and family structure. The higher the amount of inherited wealth, the stronger the "Carnegie effect", since the fixed costs of adjustment are already covered. The magnitude of the effect correlates positively with the age of the recipient. Older individuals tend to react more sensitively to inherited assets, especially when they have high alternative income sources in non-work alternatives (e.g. early retirement schemes). Moreover, heirs without children[4] and non-related heirs tend to respond with stronger reductions in labour supply. Bø, Halvorsen and Thoresen (2019) provide evidence for stronger adverse labour supply effects of the "Carnegie effect" for older individuals, non-related heirs and individuals who received higher amounts of wealth by using Norwegian administrative register data. They conclude that progressive tax rates in general as well as the higher tax burdens of non-relatives can mitigate the "Carnegie effect". This again favours an inheritance tax system where the relationship between persons is implemented. Similarly, Kopczuk (2013a) argues that an inheritance tax is preferable to an estate tax, since it can influence the distortionary behaviour of heirs to a larger extent.

Moreover, Elinder, Erixson and Waldenström (2018) emphasise the role of different saving and consumption propensities across the wealth distribution. By using population-wide register data for Sweden, they found evidence that households at the lower part of the wealth distribution steadily consume more out of the inherited wealth over time. This further has implications on the evolution over time of wealth inequality (see below).

[3] From a theoretical point of view, in case of a completely foreseen inheritance the behaviour has already been adjusted before the inheritance is actually received.
[4] Doorley and Pestel (2020) find strong adverse labour market effects for households that received an inheritance and did not have children using German data.

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3.2 DISTRIBUTIONAL EFFECTS / ACCURACY OF TAXATION

The intergenerational transfer of wealth seems to play a major role in the accumulation of wealth as well as in wealth inequality. A number of empirical findings suggest that bequests exert a stronger influence on wealth accumulation than earned income (see Leitner, 2016; Humer, Moser and Schnetzer, 2015, 2016; and Fessler and Schürz, 2018).[5] Adermon, Lindahl and Waldenström (2018) investigate the correlation between the wealth of parents and children by exploiting information about four generations in Sweden. Their results suggest that bequests and gifts account for a large part of the parent-child wealth correlation. Thus, one of the main arguments for an inheritance tax is its potential equalising effect on the wealth distribution within a generation of heirs. However, the magnitude of the inequality-reducing effect of an inheritance tax depends crucially on the ability to levy the tax on wealthy individuals. Since wealth is typically highly concentrated, the accuracy of the taxation seems to be fulfilled. Moreover, the accuracy of an inheritance tax is more pronounced, the higher the tax-free amount and the more progressive the tax rate (see Schratzenstaller, 2013).

As discussed above, inheritance tax systems can, *inter alia*, be characterised by the tax rate design as well as tax exemptions and reliefs. The tax rate design is typically determined by the relationship between the decedent and the recipient and/or the value of the assets. If a progressive tax rate is applied, the distributional effect of inheritance taxation can be increased. In contrast, the consideration of the relationship between persons only (see Italy and Denmark in table 2) allows different fixed tax rates across tax classes. In this case, the distributional effect is totally limited to the kinship between the persons involved in the inheritance process. A combination of both determinants, however, means distinct average tax rates across and within groups. In those inheritance tax systems, we thus find a double progressivity. When intergenerational transfers mainly occur within the close family, there is a lower progressivity in the tax rates in addition to a lower general tax level, limiting the equalising effect even further.

Tax exemptions are closely related to the determinants of the inheritance tax design. In countries where the relationship between individuals is irrelevant for the tax rate design, there are tax exemptions which apply to all individuals. In general, tax-free amounts are usually higher for close relatives. The spouse/partner in particular enjoys a higher tax-free amount or pays no tax, even in systems with an estate tax. Although higher tax-free amounts imply a higher progressivity in taxation, tax exemptions induce a weaker distributional effect when intergenerational transfers occur mainly within the close family. The generosity of high tax exemptions for close relatives is expected to reduce the distributional effect of an inheritance tax.

Moreover, the basis of tax assessment might have an impact on wealth distribution. There is an incentive to divide the inheritance and allocate the wealth to a

[5] There are also studies that find a less important role of inheritances for wealth accumulation (for instance, see Beznoska, Niehues and Stockhausen, 2018).

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larger number of individuals when the tax is levied on the recipients. With a number of children, the inherited wealth would be broader distributed resulting in an equalising effect (e.g. see Atkinson and Harrison, 1978), especially in the case of highly-concentrated wealth at the top.

In order to assess the distributional effect of inheritances, Karagiannaki (2017) and Bönke, van Werder and Westermeier (2017) compared wealth distribution with bequests to wealth distribution without bequests. Like most other studies that apply this comparison, they find a reduction in the relative wealth inequality, although the absolute wealth inequality increases. Inheritances are relatively more important for the accumulation of wealth for less wealthy households than richer ones.[6] This approach, however, assumes that the total inherited wealth is saved and thus increases the wealth stock of individuals and households. Differences in the saving as well as consumption behaviour across the wealth distribution may however result in diverging outcomes (see Elinder, Erixson and Waldenström, 2018). In principle, a higher marginal propensity to consume reduces the wealth stock over time. The direction of the distributional effect depends on the actual marginal propensities to save and to consume across the wealth distribution. Karagiannaki (2017) provides evidence that households at the lower part of the wealth distribution tend to reveal a higher propensity to consume out of the inherited wealth. Elinder, Erixson and Waldenström (2018) further argue that wealthier heirs are likely to receive higher returns on wealth. Thus, wealth inequality is assumed to increase steadily over time after the wealth transfer.

Empirical results for the direct effect of inheritance taxation on wealth inequality are rather scarce. Elinder, Erixson and Waldenström (2018) provide first insights into this nexus drawing on population register data on inheritances and wealth in Sweden.[7] Interestingly, their results suggest that the inheritance taxation has a small (short-run) disequalising effect on wealth inequality, as wealthier heirs generally pay more taxes in absolute terms but less in relative terms compared to less wealthier heirs. Elinder, Erixson and Waldenström (2018) however further find that the inheritance tax may increase equality, when inheritance tax revenues are used for redistribution measures. Accordingly, there might be an overall inequality-reducing effect.

3.3 TAX REVENUE POTENTIALS

The main determinants of the potential revenue of an inheritance tax regime are the definition of the inheritance tax base including exemptions and the dynamics of inheritance flows, behavioural responses of concerned individuals and the explicit tax rate design. A progressive tax rate generally implies a high tax revenue

[6] The equalising effect of inherited wealth is also supported by findings of Elinder, Erixson and Waldenström (2018), Boserup, Kopczuk and Kreiner (2016) and Wolff and Gittleman (2014).

[7] Sweden abolished the taxation of inherited wealth in 2004. Inheritance taxes in Sweden previously depended on the relationship between the deceased and the heir as well as the value of the inherited wealth (for more details see Henrekson and Waldenström, 2016).

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potential, especially in the context of highly concentrated wealth. However, when the design of the tax rates also considers the relationship between beneficiary and decedent, the progressivity and tax revenue potential are likely to be reduced. Moreover, tax exemptions influence the tax base und thus the potential revenue. In the case of an inheritance tax the testator may lower the prospective tax burden by allocating the bequest to a larger number of recipients. This might also result in a bias towards lower tax revenues as compared to an estate tax. Tax planning may also arise due to differences between inheritance and gift taxation, insofar as effective gift taxes can generally be lower than effective inheritance taxes (see Beznoska, Hentze and Stockhausen, 2020; Sommer, 2017). This can also have negative repercussions on tax revenues.

In order to shed light on differences in revenues of inheritance tax systems, we shall compare the tax income of selected countries as percentage of GDP over time. Obviously, in various countries there have been significant reforms in the inheritance tax regimes in operation, resulting in considerable changes of revenue potentials.

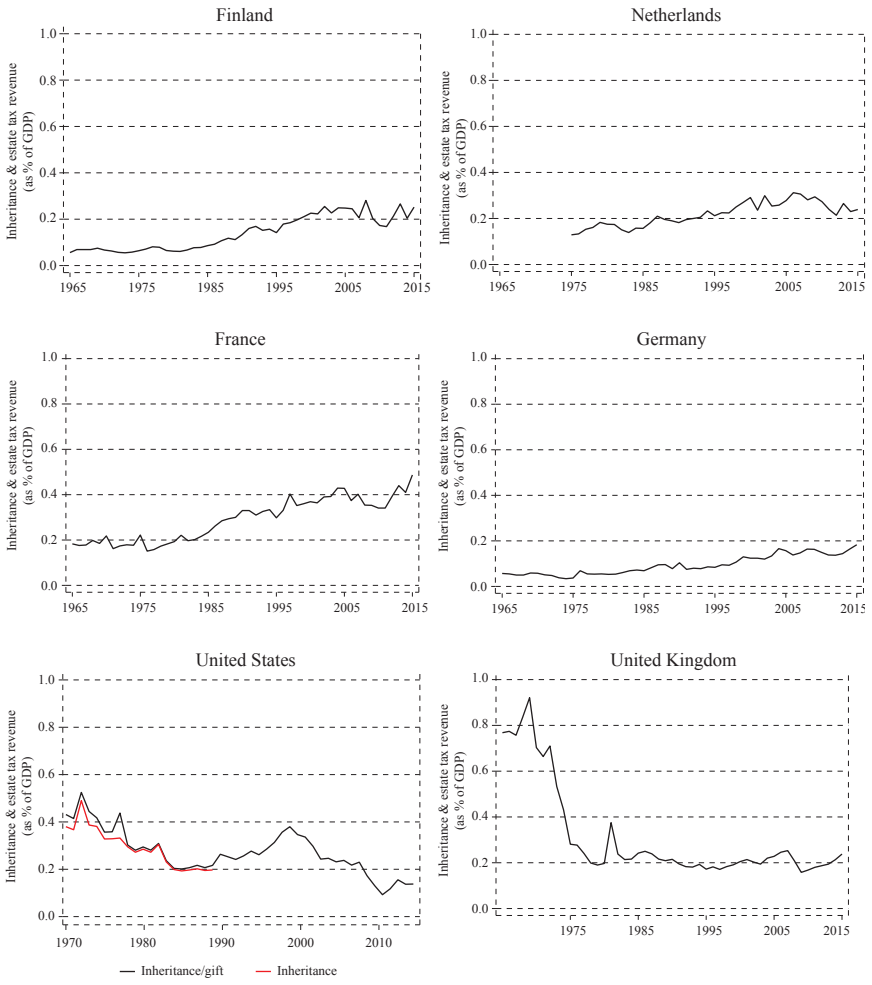
Figure 2 illustrates the evolution of inheritance and estate tax revenues in Finland, the Netherlands, Germany, France, the United Kingdom and the United States from 1965 to 2015 (US data for the estate tax are available only for 1970-1989 from the OECD, thereafter estate and gift tax is provided combined). In general, tax revenues are quite small, ranging between 0.05 and 1% of GDP. The inheritance tax system in Finland, the Netherlands, France and Germany is characterised by a double progressivity (see tables 3 and 4), whereas a uniform flat rate is applied in the United Kingdom and a progressive rate based on asset value only, in the United States. Both in the United States and the United Kingdom liberal tax reforms had resulted in sharp drops in revenues by the end of the 1980s. In general, tax exemptions and reliefs can have a substantial effect on the effective inheritance/estate tax. A large increase in exemptions and reliefs reduces the effective tax rate and thus tax revenues. In those countries applying double progressivity we observe an increasing trend in the revenue (relative to GDP) while there are almost constant revenues in the United Kingdom. In 2015, France, Finland and the Netherlands exhibit the highest inheritance tax revenues in our country sample. Their tax regimes are characterised by a strong progressivity across tax classes (see table 4). This simple descriptive comparison between countries suggests that inheritance tax systems with a double progressivity tend to result in higher tax revenues over time than differently designed regimes. However, the actual tax revenue in the US and the United Kingdom also ranges at a high level.

The overall low rates of tax revenues are often used as an argument against inheritance taxation (see Brunner, 2014). However, since the overall wealth stock tends to increase in the long-run, an inheritance tax possesses a high tax revenue potential (see Schratzenstaller, 2013). Even when the tax-free amount is high, there are still tax revenue potentials due to the concentration of wealth (see Bach, 2016; Humer, 2014).

Figure 3 presents the net private wealth to net national income ratio for our group of selected countries. The ratio has continuously increased in all countries since the 1990s. This implies that private wealth stocks have risen faster than GDP in these countries indicating a rising tax potential. The highest ratio is found in Italy, followed by the United Kingdom and France.

FIGURE 2

Inheritance and estate tax revenues (as % of GDP) in FI, NL, DE, FR, US and UK, 1965-2010



Source: OECD database, own illustration.

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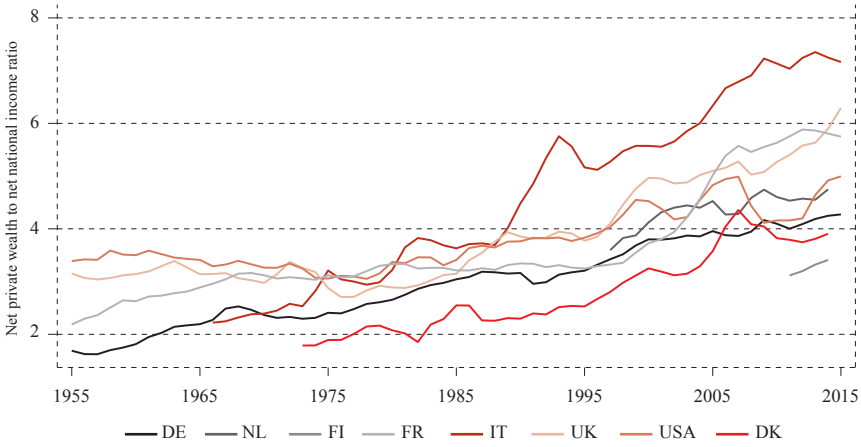
FIGURE 3

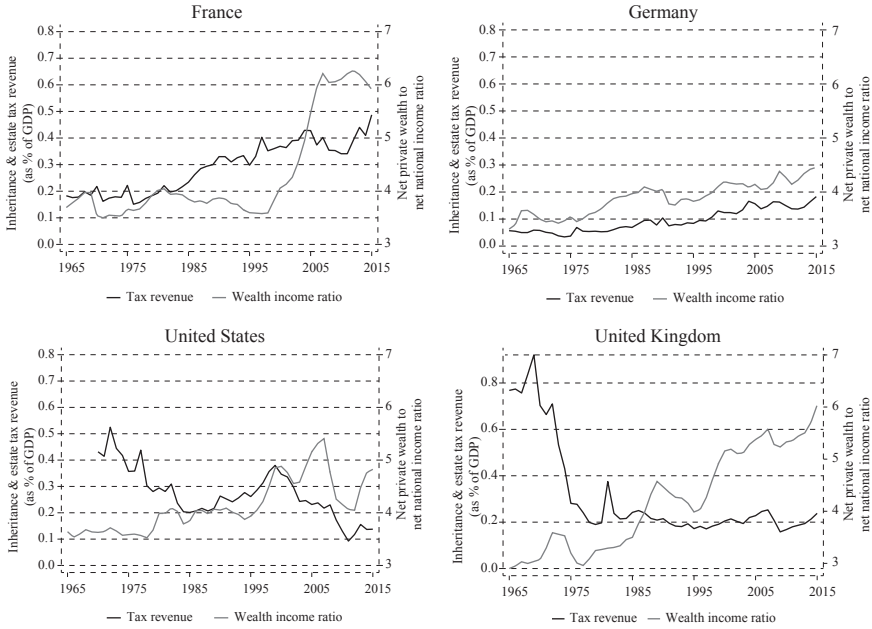
Net private wealth to net national income ratio, 1955-2015



Source: World Wealth and Income Database (WID), own illustration.

FIGURE 4

Wealth-income ratio versus inheritance tax revenue (as % of GDP), 1965-2015



Source: World Wealth and Income Database (WID) & OECD database, own illustration.

Moreover, in figure 4 we compare the actual inheritance tax revenue[8] and the corresponding potential approached by the net private wealth to net national income

[8] For the US, we consider the inheritance and estate tax as well as the gift tax revenues combined.

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ratio for France, Germany, the United States and the United Kingdom.[9] These countries are generally characterised by different tax rate designs (see tables 3 and 4). France and Germany apply a double progressivity in the tax rate system, whereas the United States only considers the value of inherited assets as a determinant for tax rates. In contrast, we find none of the discussed determinants in the tax rate system of the United Kingdom. As can be seen, we find similar paths for both, revenues and the wealth-income ratio, in France and Germany. This simple descriptive comparison suggests that the French and German inheritance tax systems seem to make use of the growing potential accruing from the rising wealth-income ratio.[10] In contrast, the regimes applied by the United Kingdom and the United States seem to not to exploit the increased wealth stock. As already discussed above, this might be related to higher tax exemptions and reliefs that lower the effective tax rates.

4 CONCLUSION

The taxation of intergenerational transfers is a much-debated topic in the public discourse. One of the main arguments against an inheritance tax refers to the claim of the family in relation to the individual property and therefore also to intergenerational transfers. The wealth accumulated over generations is the property of the family and the government is not entitled to intervene. By contrast, the basic principles of taxation suggest that individuals should be charged according to their ability to pay. Therefore, affluent individuals should contribute more in order to finance public goods. In addition, intergenerational transfers influence wealth inequality within a society and substantially determine the level of the equality of opportunity.

The analysis presented in this paper addresses differences in the design of inheritance taxation across selected European countries and the United States. In general, the main determinants in the design of the inheritance tax consider the relationship between testators and inheritors as well as the progressivity depending on the value of the inheritance. Most of our selected countries apply both in their taxation design. Intergenerational transfers within the family are in general treated preferentially; graduated tax-free amounts and exemptions are common, as are progressive tax rates. Exemptions for family businesses however often result in negative incentives for investment decisions and could thus be detrimental to economic growth. Alternatively, the taxation of intergenerational transfers of businesses could be linked to tax deferral in order to mitigate the tax burden (see OECD, 2016).

In general, it is difficult to assess the total distributional effects which result from different regimes of inheritance taxation. The overall effect is determined by the design of the tax rate, tax exemptions and reliefs (affecting the effective tax rate), the individual's behaviour as well as the actual wealth concentration. However, since we can expect a further increase in the total wealth stock and its concentration over time, an inheritance tax appears to burden wealthier households and thus

[9] Due to data limitations, we cannot show graphs for Italy, Denmark, Finland and the Netherlands.
[10] Here, the implicit assumption is that the wealth distribution across age cohorts is similar across countries. This implies that the probability of observing an inheritance is also similar across countries.

foster the ability-to-pay principle of taxation. In cases in which intergenerational transfers occur within close kinship and wealth accumulation therefore operates in a self-reinforcing way within family dynasties, taxes are levied predominantly on wealthier households. In such cases, inheritance taxation can have an equalising effect. This argument supports a strong progressivity in tax rates depending on the value of the inherited assets combined with a higher tax-free amount.

Thus, an inheritance taxation rate design should incorporate a preferential treatment of family members and consider at the same time the higher ability to pay of wealthier individuals. The consideration of both arguments in a taxation system may also improve the justification of the inheritance taxation within a society (for the role of family values for the attitude towards an inheritance tax see Fessler and Schürz, 2020). A system including, on the one hand, progressivity of tax rates depending on kinship, and on the other hand, high progressivity depending on the value of inherited wealth, seems to be appropriate to fulfil these requirements. Exemptions for family homes and tax-free amounts for family members can further foster the acceptance of an inheritance tax. Tax-free amounts however have to be limited (see OECD, 2018) in order to mitigate negative effects on tax revenues. Moreover, differences between gift and inheritance taxation should be avoided to limit incentives for tax planning.

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Assessing the impact of excise duties on a state's revenues: the case of Greece

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Abstract

The purpose of this study is to assess the impact of excise duties on tobacco products on state's revenues. Increasing excise duties on tobacco may act as a means to reduce the consumption of this product and thus to have a positive effect on citizens' health and prosperity. Our research showed that an increase in consumer income will result in a certain increase in cigarette consumption and an analogous decrease in fine-cut tobacco consumption, while a similar increase in cigarette price results in a small decrease in cigarette consumption and a very large increase in fine-cut tobacco consumption. Additionally, stepping up an anti-smoking campaign results in a decrease in cigarette consumption. Specifically for Greece we found that during 2019 and 2020 there will be a decrease in the state's revenues from excise duties on tobacco products of €150-€200 million each year.

Keywords: excise duties, specific excise tax, ad valorem excise tax, tobacco product, cigarette, fine-cut tobacco, Greece

1 INTRODUCTION

The main objectives of implementing excise duties are the following: (i) to increase state revenues, (ii) to restore external costs associated with the consumption of certain goods, (iii) to discourage the consumption of specific products and/or (iv) to achieve other objectives, such as improving resource allocation (Cnossen, 2000).

Determining the best method by which to levy excise duties is essential because they burden the final price of products and services and therefore drastically impact demand. Imposing a fixed excise duty per quantity of a product, i.e. *specific excise duty*, a fixed rate on the product's price, i.e. *ad valorem excise duty* or a combination thereof is a matter of careful choice, as the imposition of a fixed amount per quantity reduces the relative price difference between low- and high-priced products of different brands, while the imposition of a fixed rate on the original price increases the absolute price difference (Cnossen, 2000; Anastasiou et al., 2021a; Anastasiou et al., 2021b).

The choice between these two methods depends on whether the primary objective of a tax policy is to discourage consumption or increase state revenue, although a desire to improve product quality may also be of particular importance. Generally, since the damage caused by smoking is independent of prices, it is clear that excise duties must be set according to a certain quantity of the product or harmful substance. Thus, the excise duty on tobacco products should be based on the weight of tobacco, the number of cigarettes and their nicotine or tar content.

The harmonisation of taxes in the market for these products from countries imposing low excise duties restores balance to single-market systems in which free and undistorted competition plays a leading role (Cnossen, 2005; Komninos et al., 2020a; 2020b). However, the harmonisation of the tax system in the EU, despite having progressed to a certain extent, has not yet reached the point of remedying

all the disturbances that exist or may arise from the imposition of excise duties on certain products in EU member states'.

Recently, research concerning excise revenues from tobacco products has been concentrated on obtaining formulas to calculate tobacco products' consumption – and thus to calculate state revenues – using mainly elasticities of process and income, without taking into account the social context, including such factors as an antismoking campaign.

The most important gap in our knowledge comes from the absence of any extended examination of the effect of an antismoking campaign on the reduction of the percentage of people who smoke and thus the reduction in state revenues from excises, as compared to the reduction of government expenditures stemming from the decline in smoking-related health issues.

The purpose of this study is to assess the impact of excise duties on tobacco products on government revenues in the European Union (EU) and specifically in Greece, using excise duty revenue figures for the 2007-2018 period, provided mainly by the Greek Statistics Service (ELSTAT).

We hypothesize that the exact effect of changing excise taxation will depend on the elasticities of demand for cigarettes and fine-cut tobacco. We used actual data on the demand for cigarettes and fine-cut tobacco and we applied logarithmic models to estimate the demand elasticities of these products by performing a linear regression.

After the introduction, this paper consists of six parts in which there are discussions of: (i) excise duties on tobacco products in the EU, presenting the existing framework of tobacco excise duties in the EU, (ii) excise duties on tobacco products in Greece, presenting the existing framework of tobacco excise duties in Greece, (iii) excise duties on tobacco products and anti-smoking campaigns, presenting the effect of anti-smoking campaigns in the consumption of tobacco products, (iv) estimation of the demand's elasticities of tobacco products in order to estimate the impact on state revenues deriving from a change in the excise duty, (v) results of the regression analysis, providing the estimated elasticities by linear regression, (vi) conclusions.

2 EXCISE DUTIES ON TOBACCO PRODUCTS IN THE EU

For tobacco products in particular, the binding framework of tobacco excise duties – agreed upon and established in the EU and considered to be part of the acquis is a reference point for all member states (Cnossen and Smart, 2005).

Initially, the southern member states, with the support of France, tried to reduce the *specific excise duty* and increase the *ad valorem excise duty* as a form of protection because the southern member states' tobacco products were cheaper than higher-quality American blends imported by northern member states. Since an

excise duty based on the *specific excise duty*, i.e. a fixed amount per product quantity tends to shrink the relative price difference between low and high cost brands while an excise duty based on the *ad valorem excise duty*, i.e. a fixed percentage of the original price causes the exact opposite effect, the latter type was more favourable for producers in southern Europe (Papageorgiou et al., 2018).

Directive 72/464/EEC, Directive 77/805/EEC, Directive 79/32/EEC and Directive 92/79/EEC set the share of the ad valorem excise duty in a mixed excise system.

According to Directive 2002/10/EC, article 1: *"(1) each member state shall apply an overall minimum excise duty (specific duty plus ad valorem duty excluding VAT), the incidence of which shall be set at 57 % of the retail selling price (inclusive of all taxes) and which shall not be less than EUR 60 per 1,000 cigarettes for cigarettes of the price category most in demand. As of 1 July 2006, the figure of 'EUR 60' shall be replaced by 'EUR 64'. (2) Member states that levy an overall minimum excise duty of at least EUR 95 per 1,000 cigarettes for cigarettes of the price category most in demand need not comply with the 57% minimum incidence requirement. From 1 July 2006 the figure of 'EUR 95' shall be replaced by 'EUR 101'. (3) The overall minimum excise duty on cigarettes shall be determined on the basis of cigarettes of the price category most in demand according to data established as at 1 January of each year.*"

Following Directive 2011/64/EU and Commission Implementing Decision 2011/480/EU, and according to articles 8(3) and (8(4): "*(3) Until 31 December 2013, the specific component of the excise duty shall not be less than 5% and shall not be more than 76.5% of the amount of the total tax burden resulting from the aggregation of the following: (a) specific excise duty; (b) the ad valorem excise duty and the value added tax (VAT) levied on the weighted average retail selling price. (4) From 1 January 2014, the specific component of the excise duty on cigarettes shall not be less than 7.5% and shall not be more than 76.5% of the amount of the total tax burden resulting from the aggregation of the following: (a) specific excise duty; (b) the ad valorem excise duty and the VAT levied on the weighted average retail selling price.*"

Also, according to article 10 of the same Directive 2011/64/EU: *"(1) The overall excise duty (specific excise duty and ad valorem excise duty excluding VAT) on cigarettes shall represent at least 57 % of the weighted average retail selling price (WAP) of cigarettes released for consumption. That excise duty shall not be less than EUR 64 per 1,000 cigarettes irrespective of the weighted average retail selling price. […] (2) From 1 January 2014, the overall excise duty on cigarettes shall represent at least 60 % of the weighted average retail selling price (WAP) of cigarettes released for consumption. That excise duty shall not be less than EUR 90 per 1,000 cigarettes irrespective of the weighted average retail selling price.*"

Obviously, the *price category most in demand* was replaced by the *weighted average price* (WAP). After the introduction of the WAP, the basis for calculating the

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minimum rates for the excise duty on cigarettes and fine-cut tobacco also changed. The WAP for cigarettes and fine-cut tobacco would now be calculated on the basis of the total value of all cigarettes/tobacco put up for consumption based on the retail price inclusive of all taxes, divided by the total amount of cigarettes/fine-cut tobacco put up for consumption based on data relating to all quantities of these products consumed in the previous calendar year. Figure A1 shows the total taxation percentage (i.e. excise + VAT) on the final price of cigarettes in the EU's 28 member states (European Commission, 2018).

Continuous increases in the excise duties on tobacco products precipitated an increase in their final price, which, in turn, increased illegal trafficking of genuine products. When two countries in the Schengen zone have significantly divergent tobacco prices, the cross-border transport of tobacco products usually goes from member states with low prices to those with high prices. This transfer may be lawful if a citizen of a member state crosses the border to buy up to the maximum allowable quantity of tobacco or illegal if a citizen crosses the border to buy more than the permitted quantity and transfer it to sell it in the higher pricing area at a lower price. This is essentially the illegal trafficking of genuine products (i.e. contraband or Tobacco Industry illicit, known also as TI illicit). This situation may cause problems for member states wishing to increase the excise duties on and therefore prices of tobacco products. Any increase in the price of tobacco products in countries bordering lower-priced areas can create substantial price differentiation and therefore neutralise any potential benefits owing to the subsequent development of illicit trade.

Tobacco smuggling also includes the following: (i) counterfeiting that duplicates well-known brands that are produced without the legitimate owners' permission with the intention of cheating consumers and avoiding the payment of duties and (ii) illicit whites, with legally manufactured cigarettes in one country but smuggled and sold to another without duty payment. This category represents a significant proportion of the illegal cigarettes circulating with a cost not exceeding one euro per package. Figure A2 illustrates the development of cigarette's smuggling in the EU (KPMG, 2012-2019).

3 EXCISE DUTIES ON TOBACCO PRODUCTS IN GREECE

Cigarettes consumed within a country – whether produced within the country, produced and originating from another EU member state or imported from a third country – are subject to excise duty and VAT. Excise duty is structured by a fixed amount per 1,000 cigarettes, irrespective of their retail price, which was €82.5 per 1,000 cigarettes in 2018, and by a fixed percentage of 26% of the current retail price of cigarettes (including taxes), which came to €53.2428 per 1,000 cigarettes in 2018. The retail sales price including taxes is the same as the WAP, which was €204.78 per 1,000 cigarettes in 2018 (Gov. Gazette 125B/2018). For cigarettes sold at a retail price lower than the WAP, a minimum excise duty of 75% of the total excise duty imposed on the cigarettes' WAP is set. Thus, the total excise duty

is €135.7428 per 1,000 cigarettes, with a minimum excise duty of €117.5 per 1,000 cigarettes (based on Article 8(6) of Directive 2011/64/EU). Therefore, as of 2018, the total excise duty was 66.29% of the cigarettes' WAP. For fine-cut tobacco, the excise duty, starting on 1 January 2017, was €170 per kilogram (kg) net weight. In addition to the excise duty, the amount of 19.35% of the retail price of tobacco, all products were collected as VAT (Anastasiou et al., 2020).

Table 1 shows the changes in the minimum excise duty on cigarettes and fine-cut tobacco between 2007 and 2018 (Gov. Gazette 265A/2001; 169A/2006; Danchev et al., 2014; authors' calculations), according to the Article 8(6) of Directive 2011/64/EU; figure A3 shows the composition of the final price of tobacco products as a percentage of the original price, the excise duties and the VAT between 2007 and 2018 (Maniatis and Danchev, 2016). It is clear that total taxes (excise + VAT) account for approximately 86% of cigarettes' final price.

Furthermore, figure A4 depicts the evolution in the retail price of tobacco products. A significant factor in their increase is a corresponding increase in excise duties. The effects of these price changes are illustrated in the consumption histograms in figures A5 and A6 for cigarette and fine-cut tobacco consumption in the 2007-2018 period (Maniatis and Danchev, 2016; Maniatis, 2017; estimate for 2018). The revenue from excise duties on tobacco products is presented numerically in the diagram in figure A7 and as a percentage of gross domestic product (GDP) in figure A8 (ELSTAT, 2019).

The cigarette market exhibits a downward trend of almost 50% over the 2007-2018 period (see figure A5). Simultaneously, there was an increase in the consumption of the substitute product, fine-cut tobacco, which doubled between 2007 and 2012 (see figure A6). However, a major increase in the excise duty on fine-cut tobacco in 2013 led to a significant reduction in its consumption.

The impact of the 2008 economic crisis – which is expressed as a decrease in GDP and Net National Disposable Income (NNDI) – followed by a rise in prices resulting from repeated excise duty increases can explain changes in the consumption of tobacco products and consumer habits to a large extent (see figure A9). The decline in the NNDI reduces consumers' purchasing power (income effect), leading to a decrease in the demand for cigarettes. A further price increase, mainly caused by an increase in excise duties, additionally reduces cigarette consumption. Thus, an increase in the consumption of lower-priced product substitutes, such as fine-cut tobacco, was observed (the substitution effect). The latter trend persisted until there was an increase in the excise duty on substitutes, as was the case for fine-cut tobacco.

Table 1

Changes in the excise duty on tobacco products (2007-2018)

Date	Cigarettes								Fine-cut tobacco
	Min. exc. tax. €/1,000 pieces*	Sp. excise (%)	Ad valorem (%)	Total excise duties (%)	VAT as percentage of total final price (%)	Total taxes (%)	Weighted average price of cigarettes €/1,000 pieces	Initial price % of final cigarette price	Min. exc. tax. % or €/kg
Jan 2007	60.38	3.67	53.83	57.50	15.97	73.47	140.00	26.53	59.00
Jan 2008	64.69	3.67	53.83	57.50	15.97	73.47	150.00	26.53	59.00
Jan 2009	64.69	3.67	53.83	57.50	15.97	73.47	150.00	26.53	59.00
Feb 2009	69.00	3.67	53.83	57.50	15.97	73.47	150.00	26.53	59.00
Jan 2010	73.60	3.67	53.83	57.50	15.97	73.47	160.00	26.53	59.00
Jan 18, 2010	75.60	5.92	57.08	63.00	15.97	78.97	160.00	21.03	65.00
Mar 2010	78.00	6.18	58.82	65.00	17.36	82.36	160.00	17.64	67.00
May 2010	80.40	8.57	58.43	67.00	18.70	85.70	160.00	14.30	69.00
Jan 2011	76.35	12.55	52.45	65.00	18.70	83.70	156.56	16.30	67.00
Jul 2011	101.76	12.55	52.45	65.00	18.70	83.70	156.56	16.30	67.00
Jan 2012	105.48	12.55	52.45	65.00	18.70	83.70	162.27	16.30	67.00
Nov 2012	115.00	50.87	20.00	70.87	18.70	89.57	162.27	10.43	153.00
Jan 2013	115.00	50.08	20.00	70.08	18.70	88.78	164.10	11.22	153.00
Jan 2014	117.50	47.10	20.00	67.10	18.70	85.80	175.15	14.20	156.70
Jan 2015	117.50	45.38	20.00	65.38	18.70	84.08	181.80	15.92	156.70
Jan 2016	117.50	44.50	20.00	64.50	18.70	83.20	185.40	16.80	156.70
Jun 2016	117.50	44.50	20.00	64.50	19.35	83.85	185.40	16.15	156.70
Jan 2017	117.50	44.05	26.00	70.05	19.35	89.40	187.30	10.60	170.00
Jan 2018	117.50	40.29	26.00	66.29	19.35	85.64	204.78	14.36	170.00

**[Art. 16 (5) Dir. 1995/59 & Art. 8 (6) Dir. 2011/64].*

Source: Gov. Gazette 265A (2001); Gov. Gazette 169A (2006); Danchev, Maniatis and Touriki (2014); Maniatis and Danchev (2016); European Commission (2018); and authors' calculations.

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As a direct consequence of increased excise duties on tobacco products, the consumption of smuggled cigarettes and other tobacco products has also increased. It is estimated that during 2018, Greece lost approximately €670-€700 million from the consumption of approximately 4 billion smuggled cigarettes (see figures A10 and A11). Significant figures for the illegal cigarette trade in the EU were given in an annual study conducted by KPMG on behalf of the Royal United Services Institute, which included quantitative data from KPMG's annual reports. According to the survey, in 2018, Greece ranked first among the EU member states with a high rate of 23.6% in the consumption of illegal cigarettes. In second place for the same was Ireland with 20.6%, followed by Latvia with 19.5% and the United Kingdom with 19.3% (KPMG, 2019).

4 EXCISE DUTIES ON TOBACCO PRODUCTS AND ANTI-SMOKING CAMPAIGNS

One main reason for a state to adopt higher excise duties on tobacco products is to increase the state's revenue. Another important reason is to burden smokers with the negative external costs that the state initially bears to protect public health from the deleterious effects of smoking. Perhaps the strongest argument for high tobacco excise duties is their effect of discouraging young people from taking up smoking (Warner, 1995).

Conversely, the reasons for mitigating the level of excise duties on tobacco products include consumer sovereignty, as imposing high taxes on fully informed individuals is a form of paternalism and internalising the external costs of smoking to protect public health causes severe social discrimination and regression. Additionally, the high level of excise duties on tobacco products engenders difficulties in controlling smuggling, which has reached alarming proportions, particularly in Europe (Cnossen and Smart, 2005).

The choice of the type of excise duty, between the fixed amount per unit of tobacco consumed and the fixed *ad valorem* percentage, is determined according to whether the primary objective of government policy is to discourage smokers or to increase revenue and whether an improvement in the quality of cigarettes is considered desirable. A fixed amount excise duty per quantity of product (specific rate), which tends to flatten price differentials, also tends to minimise cross-border purchases, particularly if excise duties have been harmonised between countries (ibid, 2005; Liargovas et al., 2019).

Determining the appropriate level and structure of excise duties is a complex issue. According to some economists, the application of the Pigou recipe for internalising external costs resulting from tobacco consumption cannot exceed certain limits. Moreover, negative attitudes towards paternalism and social discrimination have also been expressed (ibid, 2005).

Furthermore, excise duties cannot alone fulfil the objective of government policy – to "maximise social welfare" by eliminating smoking. Some believe that an

information campaign may yield better results. For example, the results of the anti-smoking campaign in Greece are shown in figure A12, showing that the percentage of smokers in the population has decreased significantly over the last 10 years (ELSTAT, 2009, 2014; KAPA Research, 2012, 2017).

In addition, over-taxation has not proven to be an ideal practice, as shown by the increasing amount of tobacco product smuggling. In particular, during a period of economic crisis, when excise duties and other taxes increase, they negatively impact the development of the tobacco industry, with all corresponding consequences for growth and unemployment, while contributing to a rise in illegal trade, which ultimately affects state revenue negatively.

5 ESTIMATION OF THE ELASTICITY OF TOBACCO PRODUCTS

To estimate the impact on the state's revenues from an increase in the excise duty on a particular commodity in a multiple market structure, the demand for a certain product i, i.e. $Q_{i,}$, can be expressed as follows:

$$Q_i = f(Y, P_1, P_2, P_3, \ldots, A_1, A_2, A_3, \ldots) \quad (1)$$

where Y = income; P = main and substitute product prices and A = specific product characteristics, social conditions, etc.

Let us assume that certain excise duties, $T_{i,j}$, are imposed on product i during year j. Subsequently, the state's total revenue, $R_{i,j}$, from these excise duties in year j can be calculated as follows:

$$R_{i,j} = T_{i,j}\, Q_{i,j}. \quad (2)$$

For this study, it is useful to quantify the effects of income and price that enable us to predict the future of the cigarette and fine-cut tobacco markets in order to calculate the Greek government's excise revenue from these products. In this context, a model for the demand (dependent variable) for these products in Greece was created, focusing on the elasticity of demand for NNDI and product price (independent variables), as demand elasticity measures the response to changes in income and prices. Additionally, we focus on the elasticity of demand for a social factor (independent variable), which is the anti-smoking campaign.

Thus, product demand is as follows (Jenkins, Kuo and Shukla, 2000, see also equation 1):

$$Q = f(Y, P, A \ldots) \quad (3)$$

where Q = demand for tobacco products; Y = NNDI; P = tobacco product price and A = social factor (anti-smoking campaign factor).

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Demand is estimated using logarithms, and the coefficients resulting from this logarithmic transformation of the initial variables yield the elasticities of income (Y), price (P) and the anti-smoking campaign (A). Coefficients a, b and c are elasticities that demonstrate the effects of changes in the income, price and anti-smoking campaign factors, respectively. For the case of cigarettes (ibid, 2000),

$$\ln(Q_c) = a \ln(Y) + b_c \ln(P_c) + c \ln(A) + constant \quad (4)$$

where Q_c = demand for cigarettes; Y = Net National Income Available; P_c = product (cigarettes) price; a = income elasticity; b_c = price elasticity of cigarettes and c = social factor (anti-smoking campaign factor) elasticity.

In the case of a substitute, which fine-cut tobacco is for cigarettes, the price of the basic product (cigarettes) is considered and included in the equation, which significantly affects the demand for the substitute product (fine-cut tobacco) (ibid, 2000):

$$\ln(Q_f) = a \ln(Y) + b_c \ln(P_c) + b_f \ln(P_f) + c \ln(A) + constant \quad (5)$$

where Q_f = demand for fine-cut tobacco; Y = NNDI; P_c = basic product (cigarettes) price; P_f = substitute product (fine-cut tobacco) price; a = income elasticity; b_c = price elasticity of the basic product (cigarettes); b_f = price elasticity of the substitute product (fine-cut tobacco) and c = social factor (anti-smoking campaign factor) elasticity.

Data for the linear regression represented by equations 4 and 5 comprise the dependent variables, namely, demand for (consumption of) cigarettes, Q_c, and fine-cut tobacco, Q_f, from the annual data available from the Greek Ministry of Finance (see figures A5 and A6), distributed according to the state's revenues from excise duties on tobacco products for each three-month period (see figure A8) and smoothed using the moving average method (see figures A13, A14, A15).

As independent variables, we used NNDI (Y), which is available every three months, and smoothed it using the moving average method (see figure A16), the price of cigarettes, P_c, the price of fine-cut tobacco, P_f, available as a time series (see figure A4) and the anti-smoking campaign factor calculated every three months using a polynomial equation to fit the available data (see figure A12, where x = 1 for 2007, x = 2 for 2006, … x = 12 for 2018).

Statistical Product and Service Solutions software was used for the linear regression analysis. Data were analysed using a beta factor to understand the links between the dependent and independent variables. Factor R^2 was used to explain the dependent variables in the regression analysis. Moreover, t-statistics were used to determine the importance of each dependent variable to the independent variable, and an F-test was conducted to check the importance of all the independent variables. The standard estimation error was applied to test the confidence level and multiple regression analysis.

Although the revenue elasticity of income and the value derived from the regression analysis seem reasonable, linear regression should be considered since the 48 values for each variable, covering a length of a 12-year series of data, were not large enough, although they cover the period since the beginning of the Greek economic crisis.

6 RESULTS OF THE REGRESSION ANALYSIS

As table 2 shows, the basic information needed to calculate price elasticity consists of a time series for the quantity demanded, the price in the marketplace, income information and the percentage of non-smokers (in the form of a polynomial function shown in figure A12).

Using the 12-year period, 2007-2018, divided into 48 quarters, the regression outputs are shown in table 3.

The results obtained from the cigarette regression analysis (see table 3) provide an income elasticity of demand, a = 0.827, price elasticity of demand (cigarettes), b_c = −0.657, and a social factor (anti-smoking campaign) elasticity of demand, c = −1.701.

The results obtained from the fine-cut tobacco regression analysis (see table 3) yield an income elasticity of demand a = −0.863, price elasticity of demand for a substitute product (i.e. fine-cut tobacco) b_f = −1.170, price elasticity of demand for the basic product (i.e. cigarettes) b_c = 3.489 and the social factor (i.e. the anti-smoking campaign) elasticity of demand c = −2.651.

The results calculated for the demands for cigarettes and fine-cut tobacco, respectively, are illustrated in figures A17 and A18. The results obtained from the models utilised are compared to the actual demand for cigarettes and fine-cut tobacco for the 2007-2018 period. Additionally, the demands for cigarettes and fine-cut tobacco for the 2019-2020 period were calculated using equations 4 and 5, respectively. From the calculated quantities, we can ascertain the state's revenue from excise duties on tobacco products for 2019 and 2020.

From the results determined for prices and income elasticities, it is clear that cigarette smokers initially react to a cigarette price increase by consuming fine-cut tobacco. However, most return to cigarette consumption as soon as their income or the price of fine-cut tobacco increases. Generally, a 10% increase in a consumer's income results in a corresponding 8.27% increase in cigarette consumption; a 10% cigarette price increase results in a 6.57% decrease in cigarette consumption. A 10% increase in a consumer's income results in a corresponding 8.63% decrease in fine-cut tobacco consumption, and a 10% cigarette price increase results in a 34.89% increase in fine-cut tobacco consumption, while a 10% fine-cut tobacco price increase results in an 11.70% decrease in fine-cut tobacco consumption. For both cases, a 10% increase in an anti-smoking campaign results in a 17.01% decrease in cigarette consumption and 26.51% decrease in fine-cut tobacco consumption.

Table 2

Calculated state revenue from excise duties on tobacco products

Period of time	Y (NNDI) (mil. of €) smooth.	Q_c (cigarettes) calculated (bil. of pieces)	P_c (cigarettes) (mil. of €/mil. of pieces)	Q_f (fine-cut) calculated (tonnes)	P_f (fine-cut) (mil. of €/ tonne)	A (ratio to total) of non-smokers	Excise duties cigarettes (mil. of €) / (mil. of pieces)	Excise duties fine-cut tobacco (mil. of €) / tonne)	Total excise duties (mil. of €)
2019-Q1	38.5	3.15	0.2091	0.55	0.2663	0.7788	0.13686	0.17000	
2019-Q2	38.7	3.11	0.2096	0.53	0.2668	0.7859			
2019-Q3	38.9	3.07	0.2101	0.52	0.2673	0.7932			
2019-Q4	39.2	3.03	0.2106	0.51	0.2679	0.8006			
Total 2019		12.35		2.11			1,690.71	359.39	2,050.10
2020-Q1	39.4	2.99	0.2111	0.50	0.2684	0.8082	0.13739	0.17000	
2020-Q2	39.6	2.95	0.2116	0.49	0.2689	0.8159			
2020-Q3	39.8	2.91	0.2121	0.48	0.2695	0.8238			
2020-Q4	40.0	2.87	0.2126	0.46	0.2701	0.8318			
Total 2020		11.72		1.92			1,610.41	326.98	1,937.39
2019-2020		24.07		4.03			3,301.12	686.37	3,987.49

Source: Authors' calculations.

Table 3

Linear regression data and results

Per. of time	LnY	LnQc	LnPc	LnAc	LnQf	LnPf
2007-Q1	10.7299	2.0383	-2.1037	-0.4891	-1.0966	-2.1286
2007-Q2	10.7354	2.0706	-2.0956	-0.4892	-1.0643	-2.1286
2007-Q3	10.7524	2.0773	-2.0875	-0.4891	-1.0577	-2.1203
2007-Q4	10.7649	2.0930	-2.0794	-0.4887	-1.0419	-2.1203
2008-Q1	10.7786	2.0910	-2.0794	-0.4881	-1.0006	-2.1203
2008-Q2	10.7880	2.0621	-2.0636	-0.4872	-1.0294	-2.1120
2008-Q3	10.7982	2.0731	-2.0479	-0.4861	-1.0184	-2.1078
2008-Q4	10.8104	2.0726	-2.0402	-0.4848	-1.0190	-2.1037
2009-Q1	10.8086	2.0242	-2.0326	-0.4832	-0.9205	-2.0996
2009-Q2	10.7973	2.0499	-2.0025	-0.4814	-0.8948	-2.0794
2009-Q3	10.8061	2.0379	-1.9841	-0.4793	-0.9068	-2.0755
2009-Q4	10.7906	2.0462	-1.9805	-0.4770	-0.8985	-2.0636
2010-Q1	10.7862	1.8601	-1.9805	-0.4745	-0.6879	-2.0675
2010-Q2	10.7883	1.9436	-1.9733	-0.4717	-0.6045	-2.0025
2010-Q3	10.7726	1.9534	-1.8326	-0.4687	-0.5946	-1.9173
2010-Q4	10.7531	1.9343	-1.8643	-0.4655	-0.6138	-1.8971
2011-Q1	10.7254	1.8145	-1.8643	-0.4620	-0.4187	-1.8452
2011-Q2	10.6953	1.7682	-1.8579	-0.4584	-0.4649	-1.8420
2011-Q3	10.6714	1.7739	-1.8326	-0.4544	-0.4593	-1.8389
2011-Q4	10.6481	1.8210	-1.8202	-0.4503	-0.4122	-1.8326
2012-Q1	10.6141	1.6302	-1.7838	-0.4460	-0.3242	-1.8264
2012-Q2	10.5954	1.6447	-1.8018	-0.4414	-0.3097	-1.8018
2012-Q3	10.5803	1.6238	-1.8452	-0.4366	-0.3305	-1.7958
2012-Q4	10.5700	1.5755	-1.8140	-0.4317	-0.3788	-1.7898
2013-Q1	10.5623	1.5634	-1.8079	-0.4265	-0.4422	-1.7779
2013-Q2	10.5487	1.4900	-1.7603	-0.4211	-0.5156	-1.6607
2013-Q3	10.5322	1.4971	-1.7487	-0.4155	-0.5085	-1.5702
2013-Q4	10.5270	1.5127	-1.7430	-0.4097	-0.4929	-1.5465
2014-Q1	10.5105	1.4693	-1.7204	-0.4038	-0.5091	-1.5465
2014-Q2	10.5100	1.4619	-1.7148	-0.3976	-0.5166	-1.5418
2014-Q3	10.5101	1.4411	-1.7093	-0.3913	-0.5374	-1.5371
2014-Q4	10.5114	1.4409	-1.7037	-0.3847	-0.5376	-1.5371
2015-Q1	10.5133	1.4227	-1.6983	-0.3780	-0.4873	-1.5279
2015-Q2	10.5095	1.4311	-1.6928	-0.3712	-0.4789	-1.5279
2015-Q3	10.5057	1.4405	-1.6874	-0.3641	-0.4695	-1.5187
2015-Q4	10.4989	1.4173	-1.6820	-0.3569	-0.4927	-1.5141
2016-Q1	10.5036	1.3096	-1.6766	-0.3496	-0.5519	-1.4653
2016-Q2	10.5059	1.3084	-1.6713	-0.3420	-0.5532	-1.4524
2016-Q3	10.5099	1.4707	-1.6660	-0.3344	-0.3908	-1.4355
2016-Q4	10.5084	1.3565	-1.6607	-0.3265	-0.5050	-1.4271
2017-Q1	10.5025	1.3565	-1.6348	-0.3186	-0.4521	-1.3704
2017-Q2	10.5104	1.2947	-1.6145	-0.3104	-0.5140	-1.3626
2017-Q3	10.5171	1.0575	-1.5995	-0.3022	-0.7512	-1.3548
2017-Q4	10.5297	1.1995	-1.5896	-0.2938	-0.6092	-1.3471
2018-Q1	10.5365	1.0929	-1.5857	-0.2853	-0.6052	-1.3432
2018-Q2	10.5405	1.1589	-1.5852	-0.2766	-0.5391	-1.3394
2018-Q3	10.5450	1.1941	-1.5765	-0.2679	-0.5040	-1.3356
2018-Q4	10.5523	1.1816	-1.5702	-0.2590	-0.5164	-1.3250

Coefficients

Model		Unstandardized coefficients		Stand. coeffic.		
		B	Std. error	Beta	t	Sig.
1	(Constant)	-9.039	1.536		-5.885	0.000
	Ln_Y	0.827	0.162	0.306	5.092	0.000
	Ln_Pc	-0.657	0.175	-0.342	-3.765	0.000
	Ln_A	-1.701	0.310	-0.378	-5.480	0.000

Coefficients

Model		Unstandardized coefficients		Stand. coeffic.		
		B	Std. error	Beta	t	Sig.
2	(Constant)	11.758	4.083		2.880	0.006
	Ln_Y	-0.863	0.397	-0.445	-2.175	0.035
	Ln_Pf	-1.170	0.485	-1.443	-2.414	0.020
	Ln_Pc	3.489	0.479	2.522	7.284	0.000
	Ln_A	-2.651	0.824	-0.819	-3.217	0.002

Source: Author's calculations.

From the results, we can estimate the state's revenues from excise duties in tobacco products, assuming growth to be 2.1% and 2.2% and inflation to be 0.8% and 0.8% for 2019 and 2020, respectively.

Excise taxes for cigarettes will be €0.13686/piece for 2019 and €0.13739/piece for 2020; excise taxes for fine-cut tobacco will be €0.1700/gram for 2019 and €0.1700 €/gram for 2020. As shown in table 2, revenues from excise taxes of cigarettes for 2019 and 2020 will be €3,301.12 million for the two years combined, and revenues from excise taxes of fine-cut tobacco for 2019 and 2020 will be €686.37 million for both years. Thus, the total amount of excise taxes revenues is expected to be €3,987.49 million for both years.

The decreased quantities of cigarettes consumed during 2019 and 2020 are explained by the effect of the increase in NNDI being less significant than that of the anti-smoking campaign. The increased price of fine-cut tobacco, increase in NNDI (causing an increase in cigarette consumption and a decrease in fine-cut tobacco consumption) and the anti-smoking campaign are the primary reasons for the decrease in the consumed quantities of fine-cut tobacco. The final result is an overall decrease in the state's revenue from excise duties on tobacco products.

7 CONCLUSION

From the previous analysis, we can conclude that the exact effect of changing excise taxation depends on the elasticities of demand for cigarettes and fine-cut tobacco. We used actual data on the demand for cigarettes and fine-cut tobacco and applied logarithmic models to estimate the demand elasticities of these products by performing a linear regression.

Generally, an increase in consumer income will result in a certain increase in cigarette consumption and an analogous decrease in fine-cut tobacco consumption, while a similar increase in cigarette price will result in a fairly small decrease in cigarette consumption and a very high increase in fine-cut tobacco consumption. Additionally, an increase in the effectiveness of the anti-smoking campaign results in a decrease in cigarette consumption and a significantly higher decrease in fine-cut tobacco consumption. Specifically for Greece we estimated a decrease in the state's revenues from excise duties on tobacco products by €150-€200 million for each year during 2019 and 2020.

Although the elasticities obtained by regression analysis seem reasonable, their outputs should be still considered to be approximations, although these results cover the time period from the beginning of the Greek economic crisis. It is that similar conditions in other European countries be studied with the inclusion of other social parameters affecting smoking habits.

Disclosure statement

The authors state that they do not have any financial or other substantive conflict of interest.

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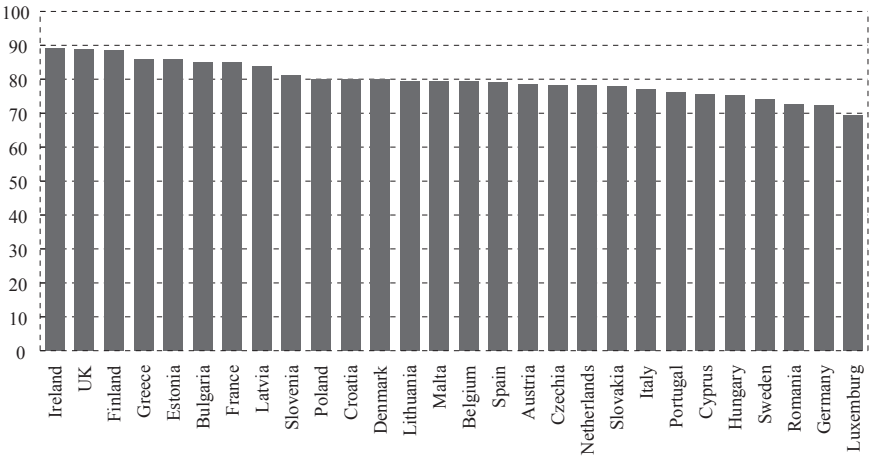
APPENDIX

FIGURE A1

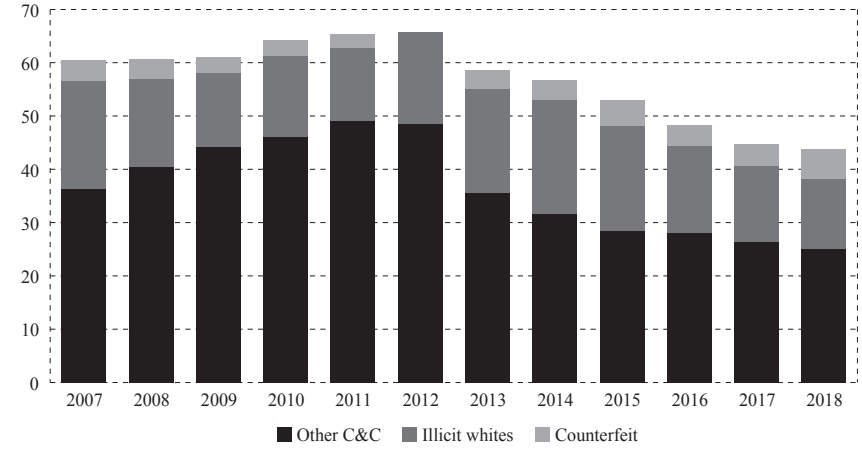
Total taxation (excise + VAT) as a percentage of the final price of cigarettes in the EU (July 2018)



Source: European Commission (2018).

FIGURE A2

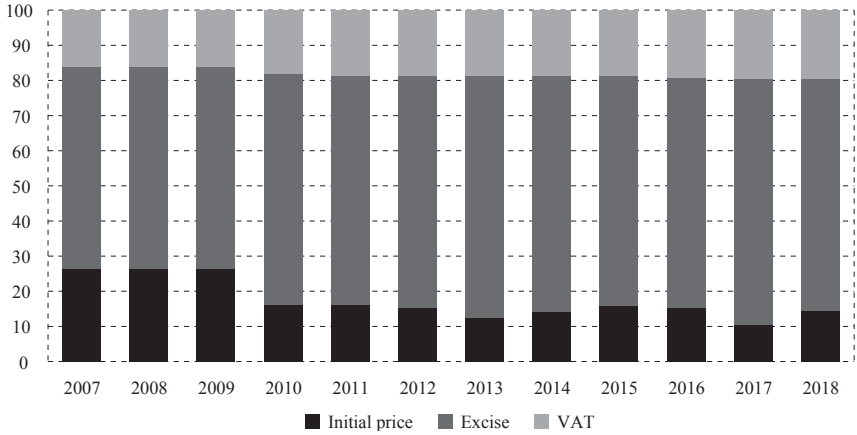
Quantity and types (in billions of pieces) of illegal cigarettes in the EU



Source: KPMG (2012-2019).

FIGURE A3

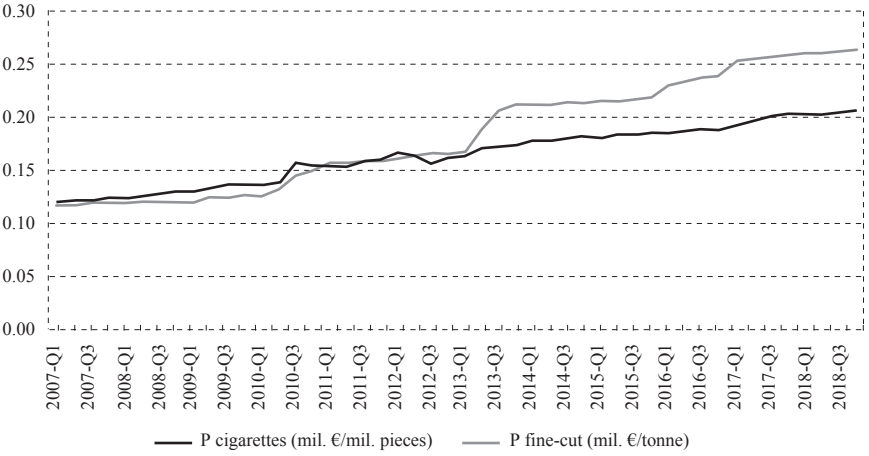
Composition (%) of the final price of cigarettes in Greece (2007-2018)



Source: Danchev et al. (2014); Maniatis and Danchev (2016); European Commission (2019).

FIGURE A4

Changes in the price of cigarettes and fine-cut tobacco (2007-2018)



Source: Danchev et al. (2014); Maniatis and Danchev (2016); KPMG (2012-2019).

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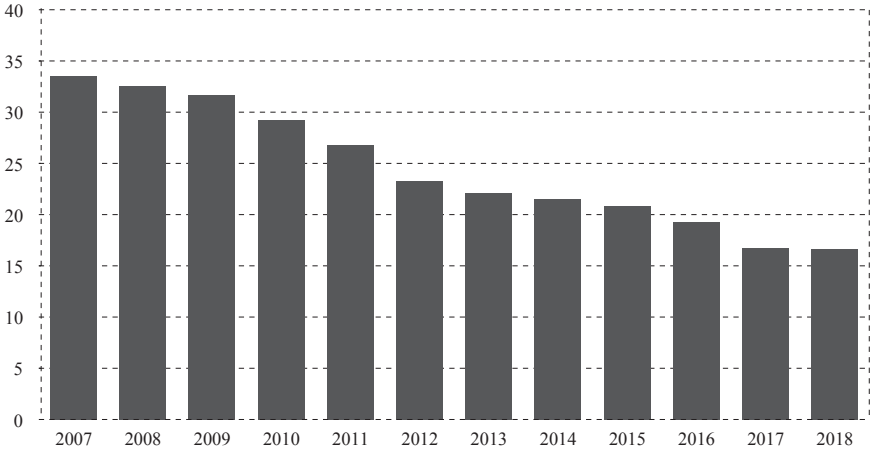
FIGURE A5

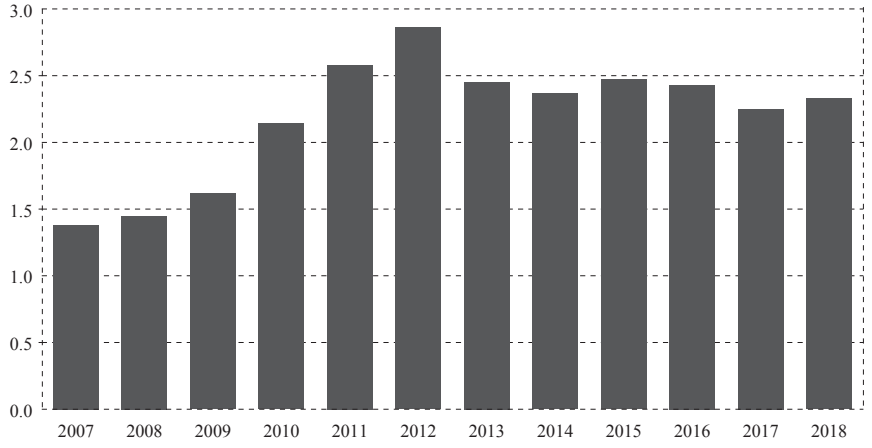
Total consumption of cigarettes (2007-2018) in billions of cigarettes



Source: Project Sun & Star Reports and KPMG (2012-2019).

FIGURE A6

Total consumption of fine-cut tobacco (2007-2018) in thousands tonnes



Source: Danchev et al. (2014); Maniatis and Danchev (2016).

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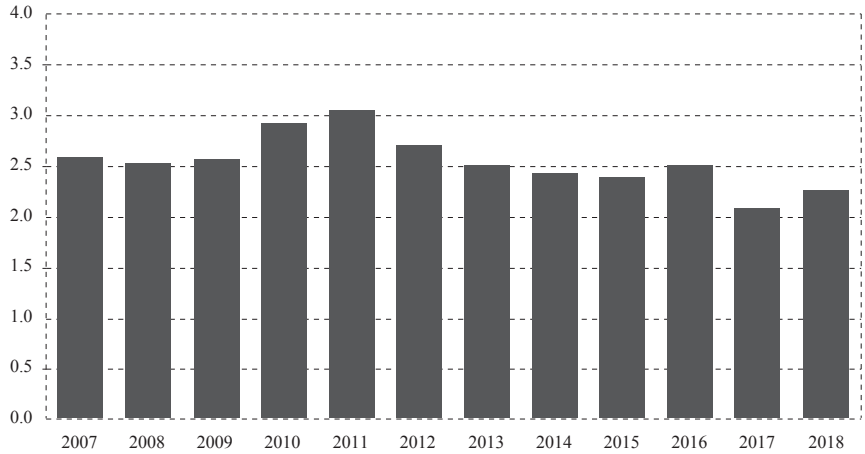
FIGURE A7

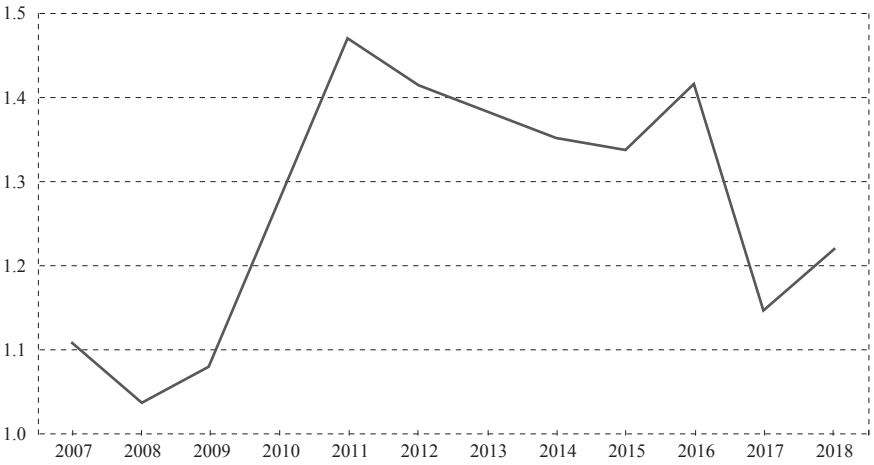
Revenue from the excise taxation of tobacco products in billions of euros



Source: ELSTAT (2019) and authors' calculations.

FIGURE A8

Revenue from the excise taxation of tobacco products as a percentage of GDP



Source: ELSTAT (2019) and authors' calculations.

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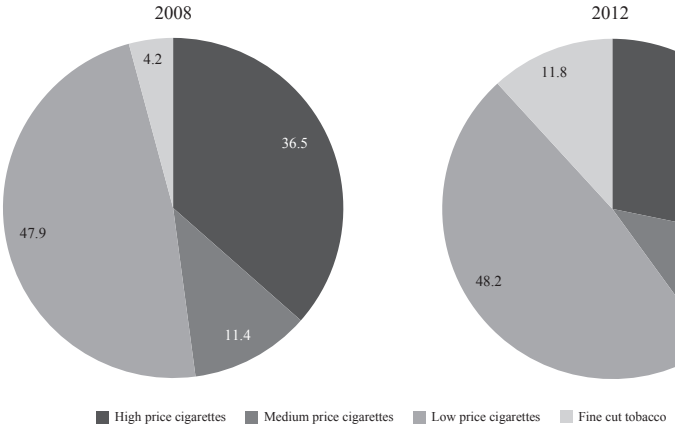
FIGURE A9

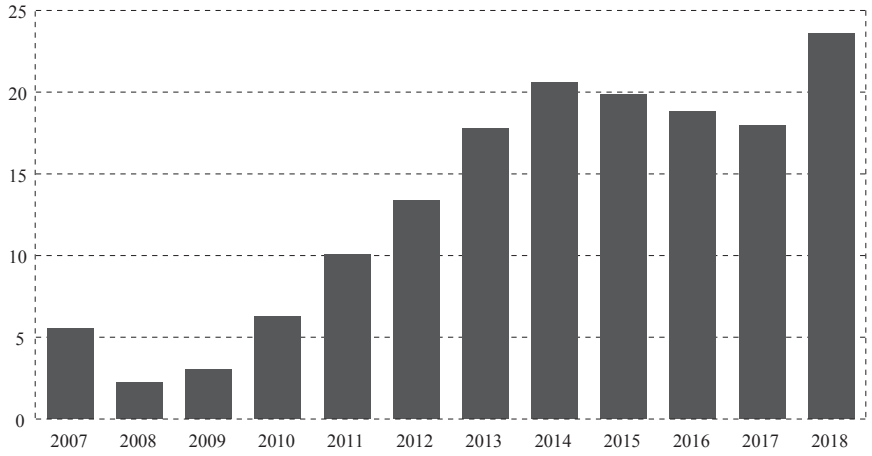
Consumption of tobacco products (weight %) before and after the beginning of the global economic crisis



Source: Danchev et al. (2014).

FIGURE A10

Consumed counterfeit, illicit whites and other C&C cigarette consumption as a percentage of total tobacco consumption in Greece (2007-2018)



Source: KPMG (2012-2019).

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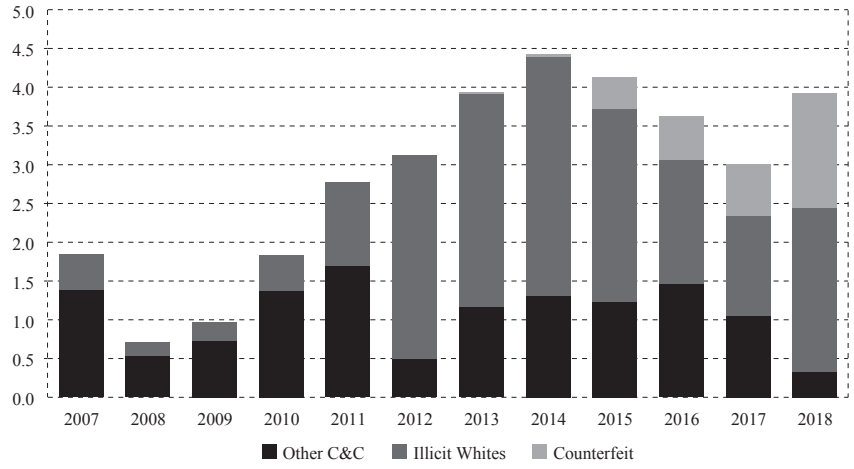
FIGURE A11

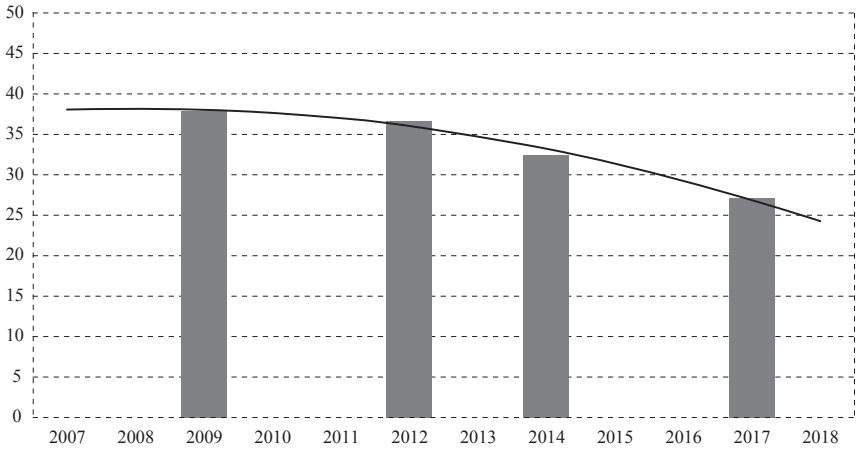
Consumed counterfeit, illicit whites and other C&C cigarette consumption in Greece in billions of cigarettes (2007-2018)



Source: KPMG (2012-2019).

FIGURE A12

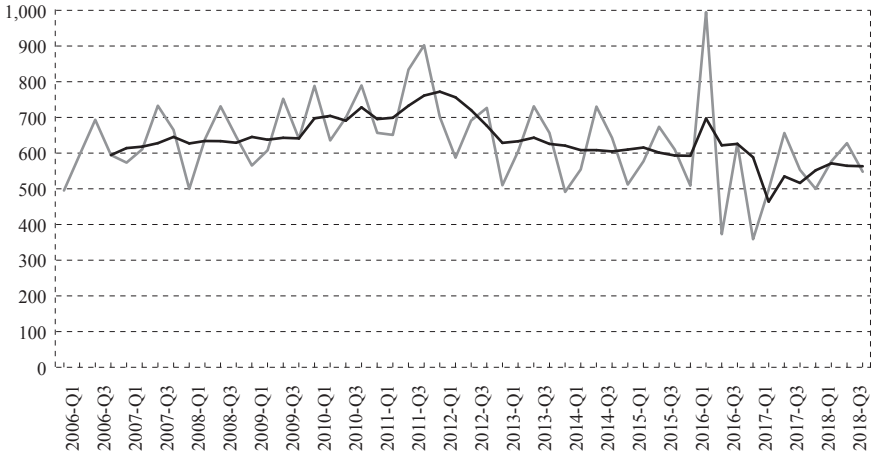
Percentage of smokers in the population of Greece



Source: ELSTAT (2009, 2014); KAPA Research (2012, 2017).

FIGURE A13

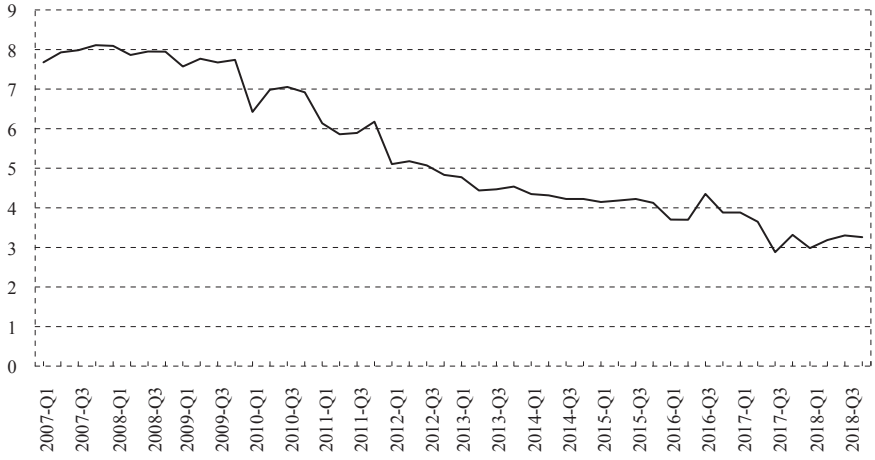
Revenues from the excise taxation of tobacco products, in millions of euros



Source: ELSTAT (2019) and authors' calculations.

FIGURE A14

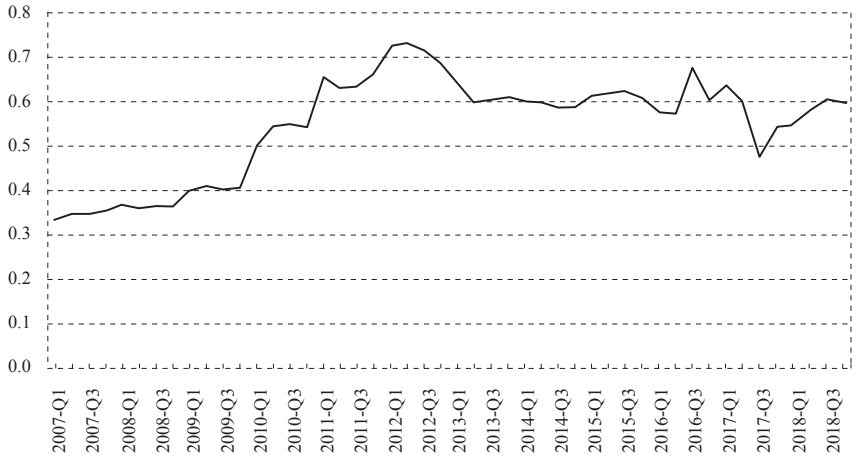
Q_c, consumed quantities of cigarettes, in billions (smoothened)



Source: KPMG (2012-2019) and authors' calculations.

Figure A15

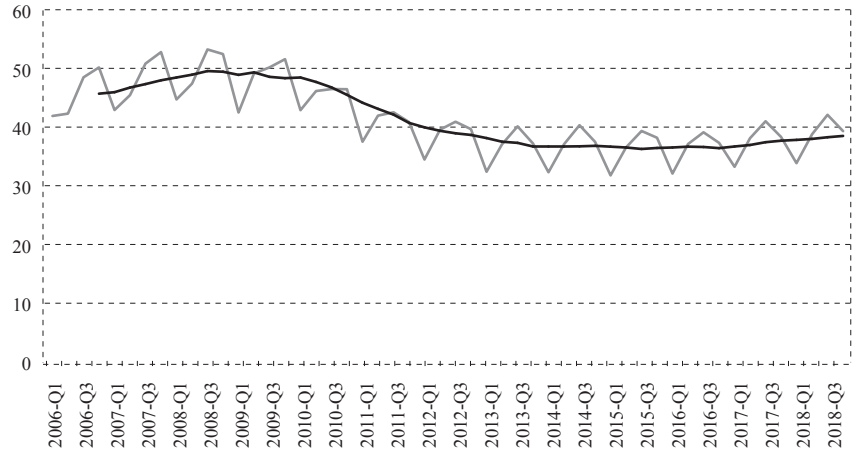
Q_f, consumed quantities of fine-cut tobacco in 1,000 tonnes (smoothed)



Source: Danchev et al. (2014); Maniatis and Danchev (2016); and authors' calculations.

Figure A16

Y Net National Disposable Income (NNDI), actual and smoothed (millions of €)



Source: ELSTAT (2019) and authors' calculations.

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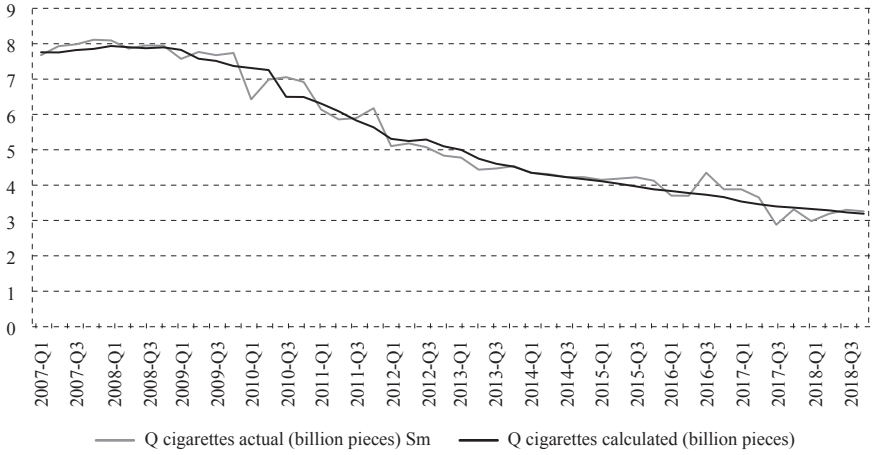
FIGURE A17

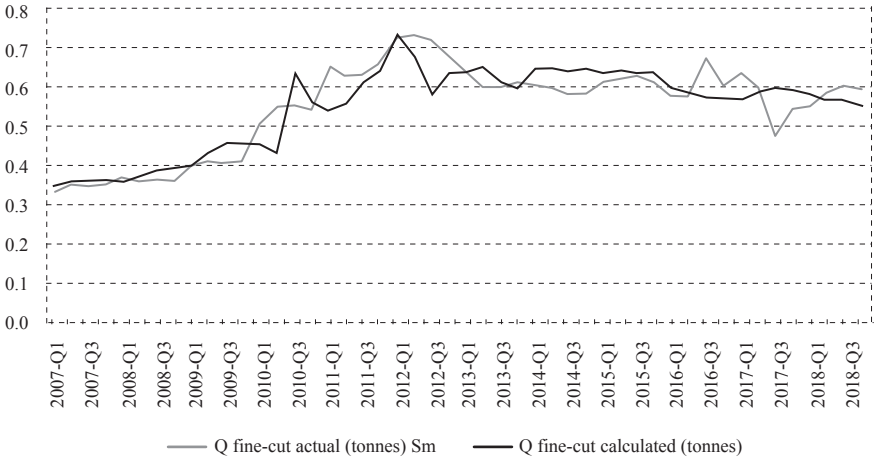
Consumption of cigarettes actual and calculated in billions of pieces



Source: Authors' calculations.

FIGURE A18

Consumption of fine-cut tobacco actual and calculated in 1,000 tonnes



Source: Authors' calculations.

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