Unconditional Basic Income in Portugal: How can we afford it?

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ABSTRACT I present an implementation proposal of an Unconditional Basic Income (UBI) for Portugal that does not consider second-order effects. I argue that the implementation of a first step towards UBI (an Unconditional Income with a lower amount) not only is politically more feasible than a complete implementation, but also allows for a better estimation of the economic consequences of each consecutive step. I present an implementation proposal based on Pigouvian taxes aimed at addressing the environmental challenges humanity faces. I estimate the optimal Unconditional Income based on Pigouvian taxes as 104.1€, and I find that 62% of Portuguese households would increase their real disposable income. The richest households would face a 8.4% decrease in their real disposable income while the poorest would face a 52.3% increase. I discuss the long-term effects of this proposal and how to bridge it with a future UBI implementation.
KEYWORDS UBI; economics; ecological sustainability.

RESUMO Apresento uma proposta de implementação de um Rendimento Básico Incondicional (RBI) para Portugal que não considera os efeitos de segunda ordem. Defendo que a implementação de um primeiro passo para o RBI (um Rendimento Básico Incondicional de montante inferior) não só é politicamente mais viável do que uma implementação completa, como também permite uma melhor estimativa das consequências económicas de cada passo consecutivo. Apresento uma proposta de implementação baseada em impostos pigouvianos com o objetivo de responder aos desafios ambientais que a humanidade enfrenta. Estimo que o rendimento incondicional óptimo baseado nos impostos pigouvianos é de 104,1 euros, e concluo que 62% das famílias portuguesas aumentariam o seu rendimento disponível real. As famílias mais ricas sofreriam uma redução de 8,4% do seu rendimento disponível real, enquanto as mais pobres registariam um aumento de 52,3%. Discuto os efeitos a longo prazo desta proposta e a forma de colmatá-la com uma futura implementação do RBI.
PALAVRAS-CHAVE RBI; economia, sustentabilidade ecológica.

1 Introduction

Unconditional Basic Income (from now on abbreviated as UBI) is a guaranteed regular, liveable and unconditional income provided by the state to all citizens or long-term residents.

Unconditional Basic Income has been discussed since at least the sixteenth century (More, 1997). In the eighteenth and nineteenth centuries several writers and thinkers such as Thomas Paine (1945), Thomas Spence, Allen Davenport, Charles Fourier, Joseph Charlier, E. Mabel, Dennis Milner, Bertram Pickard, C. Marshall Hattersley, G.D.H. Cole and Juliet Rhys-Williams wrote in defense of UBI (as cited in Cunliffe & Erreygers, 2004). The first social movement for basic income developed in the beginning of the twentieth century and names such as Bertrand Russell were associated with it (1919). Today, UBI draws ideological support from both principled and pragmatic arguments (Wispelaere, 2015).

Philippe Van Parijs in the very impactful work *Real Freedom for All* (1997) presented a freedom-based argument for UBI. Other variants of freedom-based arguments were presented, particularly in republican (Casassas & Wispelaere, 2015; Pettit, 2007), liberal-egalitarian (Birnbaum, 2012; Maskivker, 2011) and libertarian form (Tomasi, 2012). A different strand of principled arguments for UBI was presented, among others, by Pateman (2004) and Goodhart (2007), which was based on individuals' foundational right to participation in the decisionmaking process of the polity, which is crucial for a functioning democracy.

Pragmatic justifications for UBI start by identifying a desirable social goal and then argue that a basic income is an efficient way of achieving that goal. UBI is presented as having positive effects on poverty, social inclusion, income inequality, health, gender equality and environmental impact of economic activity (Birnbaum, 2010; Forget, 2011; McKay, 2007; Offe, 2008; Standing, 2002).

The debate regarding the practical merits or dangers of UBI, or the ethical and moral reasons for and against such policy is often side-lined by the important instrumental discussion of its financing. Can we afford a UBI in Portugal? If so, how should we do it? I present previous proposals and add my own (section 2), all of them ignoring second-order effects[1]. I

1 First-order effects of a given policy are those that may be estimated by extrapolating linearly. They are direct, straightforward, and such estimates are adequate if the policy change is small. Higher-order effects are more indirect and may be neglected for small

argue, however, that second-order effects are massive and can neither be ignored nor reasonably estimated (section 3). I proceed to argue that the implementation of a first step towards UBI not only is more politically feasible than a complete implementation, but also allows for a better estimate of the economic consequences of each step (section 4). I add that a first step towards UBI based on Pigouvian taxes that address the environmental unsustainability of current economical activity would have several economical, political and environmental advantages (section 5). I present estimates regarding the financing of such a proposal (section 6). I elaborate on the political implications, long-term economic consequences and other issues regarding that proposal (section 7). I then conclude (section 8).

2 Estimates for UBI implementation

The question of how to finance a UBI in Portugal was addressed by Castro (2018) and Teixeira (2019) among others[2].

Castro presents three scenarios for UBI implementation. The first two scenarios (shown in tables 1 and 2) constitute a partial implementation of UBI (with monthly incomes of 100€ and 200€ to all adults respectively) whereas the third scenario is presented as a complete UBI (with a monthly income of 450€ to all adults). The first two scenarios are financed mostly by increases in income taxes (IRS) and consumption taxes (IVA). The third scenario considers some savings in social services (mostly education and health) due to decreased pressure on those services as a result of beneficial outcomes of UBI, yet those savings are not estimated. Other proposals mentioned for the financing of this scenario, such as a land tax or a CO2 tax, are not estimated as well. Castro then considers the possibility (and desirability) of an European implementation.

Teixeira studies what proportion of UBI financing needs could be obtained through a reformulation of income taxes, either considering a flat tax (shown in figure 1 and 2 for an income of 200€ and 420€ respectively), or considering progressive tax brackets (shown in figure 3

policy changes, but become important for big policy changes. For those, another estimation approach is needed.

2 This matter had been previously addressed by Fabio Matias and Miguel Horta, for example in BIEN (2024).

and 4 for an income of 200€ and 420€ respectively). While in some scenarios income taxes could almost meet or even surpass UBI financing needs, Teixeira concludes that the taxes required would be too demanding and other financing sources are needed. Some examples of additional financing sources are discussed, but not estimated. Furthermore, Teixeira admits that second-order effects were not estimated.

Table 1: Financing of scenario 1 proposed by Castro

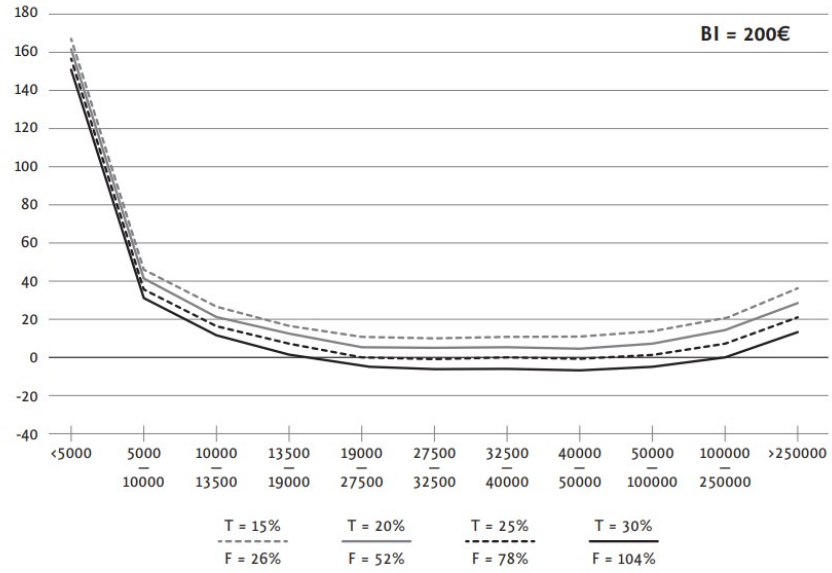
Scenario 1 - 100€ per adult			
Total cost		10.8×10^3 M€	
Cost after transfer adjustment		6.7×10^3 M€	
Income tax			
Tax brackets	Current tax (%)	Proposed tax (%)	Increase in revenue (M€)
Up to 10 k€	14.5	18	82
From 10 k€ to 19 k€	28.5	35	267
From 19 k€ to 40 k€	37	45	826
From 40 k€ to 100 k€	45	55	1188
Above 100k€ k€	48	60	622
		Total	2986
Aditional income special taxes			
From 80 k€ to 250 k€	0	2.5	578
Above 250 k€	0	5	
Consumption taxes			
Luxury goods - a 7% tax			630
Adjustment of other consumption taxes (IVA)			2502

Both Teixeira and Castro consider that state transfers (such as retirement pensions, unemployment benefits, etc.) below the UBI would be discontinued, while state transfers above the UBI would be reduced by the UBI amount. This option is based on the premise that beneficiaries of

those transfers would not be worse-off due to the UBI. That is not necessarily the case if UBI is financed by sources other than income taxes, however. If the nominal disposable income of some beneficiary of a state transfer stays roughly the same, but part of the UBI is financed by an increase in consumption taxes, for example, the real disposable income of that beneficiary would decrease.

Table 2: Financing of scenario 2 proposed by Castro

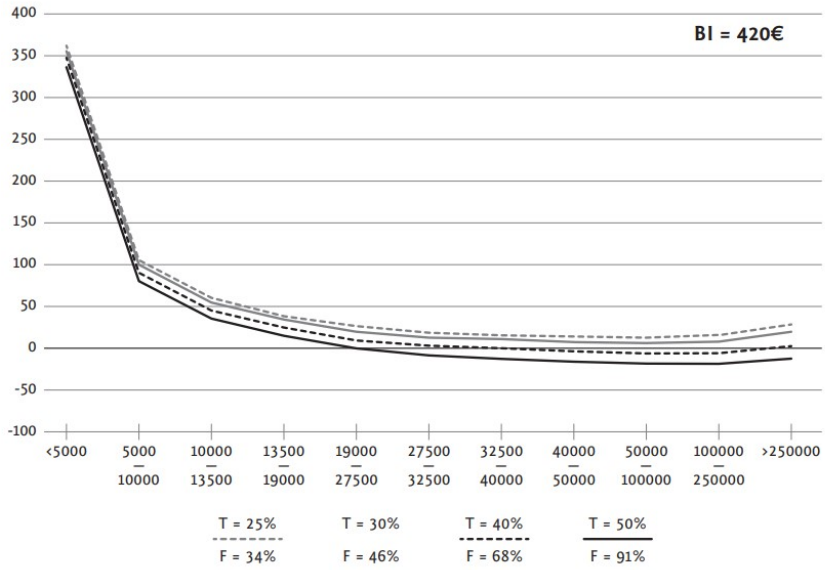
Scenario 1 - 100€ per adult			
Total cost		21.6×10^3 M€	
Cost after transfer adjustment		14.8×10^3 M€	
Income tax			
Tax brackets	Current tax (%)	Proposed tax (%)	Increase in revenue (M€)
Up to 10 k€	14.5	21.5	153
From 10 k€ to 19 k€	28.5	41.5	497
From 19 k€ to 40 k€	37	47	958
From 40 k€ to 100 k€	45	57	1188
Above 100k€ k€	48	62	674
		Total	3604
Aditional income special taxes			
From 80 k€ to 250 k€	0	2.5	578
Above 250 k€	0	5	
Consumption taxes			
Luxury goods - a 14% tax			1080
Adjustment of other consumption taxes (IVA)			6118
Taxes associated with tourism			
Total revenue			2592



Note: parameters T and F represent, respectively, the income tax and the proportion of UBI financing needs met.

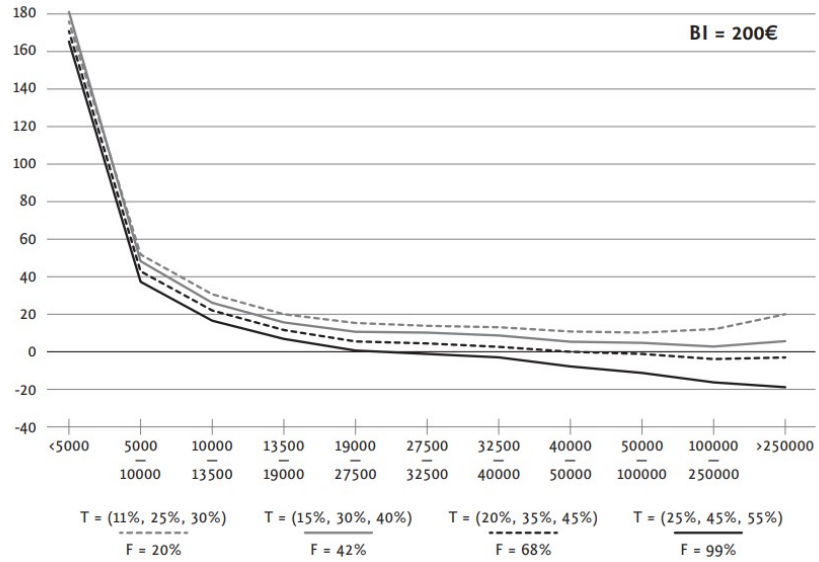
Figure 1: Change in income as a consequence of the introduction on a UBI with a monthly value of 200€, per tax bracket according to Teixeira (2019). Financing through an income flat tax.

Neglecting second-order effects facilitates the estimation of any given implementation of a UBI. I present an estimate of a lower bound for a UBI net-cost in table 3, considering a monthly income of 540€ (the poverty threshold in Portugal) to be payed to all adults. The net-cost of a UBI implementation is the aggregate cost payed by those who would not see an increase in real disposable income under that implementation. The lower bound for implementation that does not increase the cost for 99% of tax paying households assumes that the income tax rises by the amount of the UBI. This leaves the UBI of all non-contributors to be payed by the remainder 1% of tax-paying households. If one considers that retirement pensions above the UBI are reduced by the UBI amount and that those below the UBI are replaced by the UBI, then the net cost decreases to 3.4×10^3 M€ (about 1.5% of GDP), which seems to be a viable proposition. Increases in the taxes of the 1% households with higher income (for reference, adding 20 pp to marginal taxes in these brackets), and a land value tax to replace the current housing taxes (IMI) calibrated to multiply its revenue 2.5 fold could easily pay this cost while improving efficiency and contributing to lower housing costs (McCluskey & Franzsen, 2017) and consequently increase the real income of most households.



Note: parameters T and F represent, respectively, the income tax and the proportion of UBI financing needs met.

Figure 2: Change in income as a consequence of the introduction on a UBI with a monthly value of 420€, per tax bracket according to Teixeira (2019). Financing through an income flat tax.



Note: parameters T and F represent, respectively, the income tax and the proportion of UBI financing needs met.

Figure 3: Change in income as a consequence of the introduction on a UBI with a monthly value of 200€, per tax bracket according to Teixeira (2019). Financing through a progressive income with 3 tax brackets: [0-32500€];[32500-100000€];]100000+].

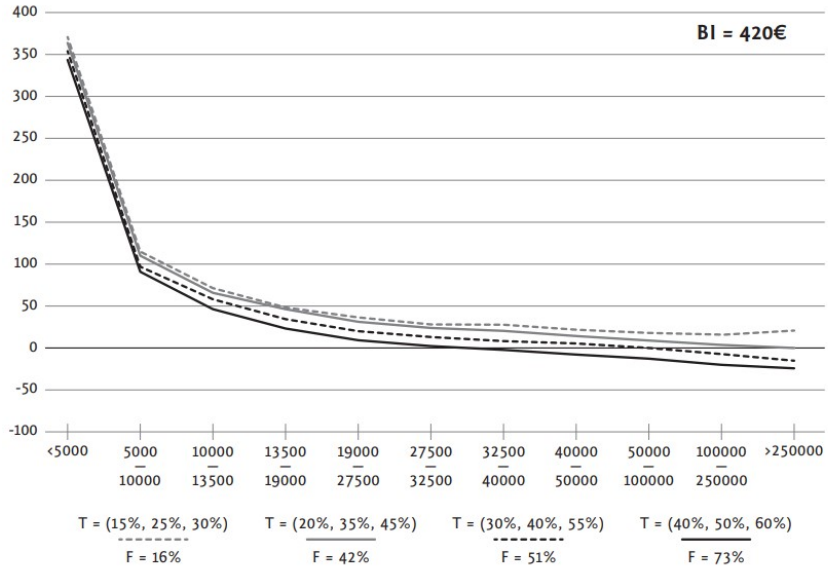
This, however, is not a proposal, but a lower bound: a UBI that does not change the disposable income of 99% of all tax contributors mostly defeats its whole purpose and UBI becomes, in all but name, quite conditional. In this extreme implementation, UBI would be little more than a substantial increase of state-transfers such as the guaranteed minimum income ("Rendimento Social de Inserção"). In table 4, I instead present a possible implementation of a UBI that ignores second-order effects.

Table 3: Lower bound for UBI financing needs and revenue to satisfy it

UBI of 540€	
Item	Cost (M€)
Cost for all population	66.8×10^3
Cost for all adults	55.1×10^3
Cost after transfer adjustment	44.7×10^3
Aditional revenue from income taxes (99% of households)	41.3×10^3
Lower bound for net-cost	3.4×10^3
Aditional revenue from income taxes (1% of households)	1098
Aditional revenue from a land value tax	2255

Table 4: Proposal for full UBI implementation

UBI of 540€			
Total cost for all adults	55.1×10^3 M€		
Cost after transfer adjustment	46.9×10^3 M€		
Income tax			
Tax brackets	Current tax (%)	Proposed tax (%)	Increase in revenue (M€)
From 48 k€ to 75 k€	45	60	733
Above 75 k€	48	68	2350
		Total	3.1×10^3
Pigouvian environmental taxes	33.7×10^3 M€		
Aditional revenue from a land value tax	9.2×10^3 M€		
Inheritance tax	2.6×10^3 M€		
Surplus	1.7×10^3 M€		



Note: parameters T and F represent, respectively, the income tax and the proportion of UBI financing needs met.

Figure 4: Change in income as a consequence of the introduction on a UBI with a monthly value of 420€, per tax bracket according to Teixeira (2019). Financing through a progressive income with 3 tax brackets: [0-32500€];[32500-100000€];]100000+].

Again, I consider a monthly income of 540€ to be payed to all adults. I consider an increase of 15 pp in the marginal tax for the tax break between 48 k€ and 75 k€ and an increase in the marginal tax of 20 pp for the tax break above 75 k€. To estimate the revenue I use the same procedure of Castro (2018), albeit with values adjusted for the 2019 values (Autoridade Tributária e Aduaneira, 2020), and obtain 3.1×10^3 M€ as an increase in income tax revenue. Pigouvian taxes[3] pay 33.7×10^3 M€, or 61.2% of the required revenue (this estimate is detailed in section 6). The land value tax would be calibrated to obtain seven times the revenue of IMI, which would represent an increase in revenue of 9.2×10^3 M€.

In a recent report OECD (2021) stresses the potential benefits of inheritance taxes and related gift taxes in addressing inequality, and I propose an inheritance tax calibrated for a revenue of 1.2% of GDP (still below those of Japan, France, Belgium and South Korea), capable of paying the remainder of the UBI cost. The inheritance tax is a specially

3 A Pigouvian tax is a tax on a market transaction that creates a negative externality, that is, a cost, borne by individuals not directly involved in the transaction. Taxes related to pollution are an example of Pigouvian taxes.

practical form of wealth tax, and it may be designed to have an impact only on the wealthiest households.

I consider that, contrary to previous proposals, UBI should increase the disposable income of those that already receive state transfers, even if those transfers are above the UBI amount, not least because other increases in taxes to pay for UBI would inevitably decrease the real income in those cases. However, still guaranteeing an increase in nominal income, social transfers could be reduced by the following percentage, as a function of the transfer size:

$$\Delta T/T\,(T) = -1 / (1 + T/U)\,. \qquad (1)$$

where T is the transfer amount, U is the UBI amount. If second-order effects were not at play, this implementation proposal would be enough to answer affirmatively to the question of whether we can afford a UBI in Portugal, even though many other possibilities, representing other political choices and priorities could be presented as well. To find the amount saved I follow the procedure in Castro (2018) while plugging in expression 1. Whenever I do not have enough information about the distribution, I use average values. Total savings amount to 8.2×10^3 M€. Notice that further proposals in this paper regarding the financing of an Unconditional Income do not decrease any government transfer amount.

All these proposals have been skillfully summarized by Neves and Merrill (2023).

3 Second-order effects

Previous analyses implicitly assume that declared income values (and income values themselves) do not change as a result of UBI and the tax changes required to pay for it. On the flip side, those analyses do not estimate savings in social services as a result of UBI positive outcomes: by eliminating poverty and decreasing inequality, UBI would likely decrease crime, health needs, and other similar expenditures (Wilkinson & Pickett, 2009). Any estimate of those savings would be speculative, at best.

The impact of second-order effects on revenue may be massive. In section 6, the revenue of Pigouvian taxes is estimated accounting for second-order effects (with realistic values for the price-elasticity

of products being taxed) and without accounting for second-order effects (assuming products are perfectly inelastic in the short-term). The revenue of taxes without considering second-order effects is 33.7 $\times 10^3$ M€, but when those effects are considered it drops to 10.7 $\times 10^3$ M€.

Economists present two ways in which UBI and its financing could decrease income and, consequently, tax revenue: the *income effect*[4] and the *substitution effect*[5]. The income effect is not contingent on any specific financing mechanism and could exist even if UBI was, as is the case in pilot-experiments, financed by a windfall. UBI pilot-experiments or analysis of policy programs closely related to UBI (like Iran's cash-transfer program) give mixed results: some identify a small decrease in the number of hours worked (Hum & Simpson, 1993; Widerquist, 2005), while others do not find any negative labor supply effect for either hours worked or the probability of participation in market work (Salehi-Isfahani & Mostafavi-Dehzooei, 2017). Economic literature in general assumes that non-wage related income in general decreases labour supply (empirical estimations were conducted by Cesarini et al, 2017; Disney & Gathergood, 2016), and it is estimated that the same is true for UBI in particular (Greenberg & Kosters, 1970). The debate is still unsettled.

However, even if one argues that the income effect is non-existent, outweighed by the impact of UBI in ending the *poverty trap* (Widerquist, 2001), or has an overall small magnitude, both income taxes and consumption taxes used to pay for UBI would give rise to a *substitution effect* that would decrease labor income. Notice that the reduction in labor income is not a consequence of UBI itself: the same increase in taxes would have the same effect, even if it was used to finance other policies. Any estimation of the revenue obtained through an increase in consumption or income taxes should account for this effect together with the incentive to declare an income smaller than its actual value. That is the reasoning behind the estimation of the *Laffer Curve*[6]. The

4 The income effect describes how the income of an agent impacts their choice, in particular the allocation of time for leisure. An increase in income favours a lower allocation of time for labor. Notice that the income effect is not the only effect at play in that choice, however.

5 The substitution effect describes how consumption is impacted by changing relative prices. Considering real net wage as the *price* of leisure, a decrease in real net wage favours a lower allocation of time for labor. Notice that the substitution effect is not the only effect at play in that choice, however.

6 The *Laffer Curve* describes the non-linear relation between the tax rate and the tax revenue. It has an inverted-u shape: if the tax rate is zero, tax revenues will be zero, and if the

Laffer Curve has been estimated for the USA (Trabandt & Uhlig, 2011), OECD countries (Hansson & Stuart, 2003; Hassett & Brill, 2007) and European countries (Espanhol, 2014; Oliveira & Costa, 2015). Few estimates for Portugal discriminate the Laffer curve by tax type, but according to those estimates the consumption tax that maximizes fiscal revenue is 22.5%, and the marginal income tax that maximizes revenue is 47.7%. If these values are to be believed, very little revenue to finance a UBI may be obtained trough any of these sources.

The effects of taxing capital are, at best, equally uncertain. Judd (1985) and Chamley (1986) argue that, even when considering that workers do not own any wealth, taxes on capital would decrease workers' income[7] on the long term more than taxes on their income capable of generating the same revenue. This result has been challenged (Banks & Diamond, 2010; Straub & Werning, 2020; Werning, 2007), but the debate has not yet been settled. While the estimation of the short or medium term-effects of a small increase in the effect of taxes on capital is possible, the estimation of the long term effects of an increase that could present a significant contribution to the financing of a UBI is impossible.

If either the income or substitution effect decrease labor supply, then gross wages are expected to rise, at least in the short or medium term. Gama (2018) studied this effect showing that some values of UBI, even if paid exclusively through labor taxes, would lead to an increase in the income of labor-market participants due to the increase in wages. Capitalists would be the ones with a lower income (due to lower labor supply) even when not paying a single euro for UBI directly. Gama computed the UBI amount that maximizes the disposable income of labor-market participants under this framework (figure 5) and found that, when values are calibrated for Europe, a UBI worth 25% of average wages is the one that maximizes disposable income for labor market participants (figure 6). This increase in wages interacts non-linearly with a progressive tax schedule such as the Portuguese one, and makes financing a UBI easier: as wages increase more workers change their tax bracket to one with a marginal tax closer to the maximizer of the *Laffer Curve*.

tax rate is 100%, the tax revenue will be zero as well. Between these two extremes lies the tax rate that maximizes the tax revenue.

7 Judd (1985) and Chamley (1986) account for the decrease in wages that would follow a decrease in capital stock caused by such taxes.

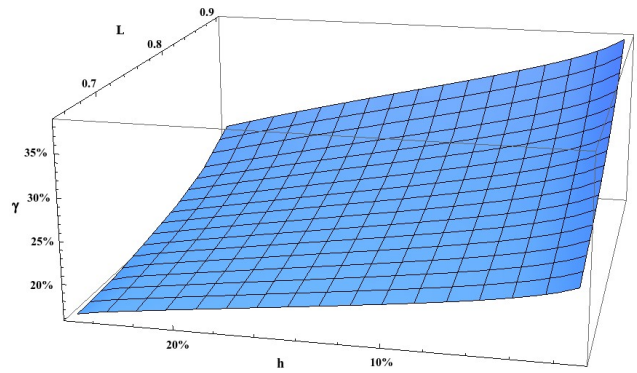


Figure 5: UBI amount γ (expressed as a proportion of average wage) that maximizes labor--market participant's income, as a function parameters *L* and *h*, according to Gama (2018). These parameters determine the distribution of preferences regarding leisure over the population.

All these effects are highly non-linear in nature. This means that one may reasonably estimate the impact of a small increase in UBI value (and thus compute how to finance it), extrapolating from adequate empirical data; but one may not reasonably estimate the impact of creating a proper UBI when none exists. The question of whether we afford a UBI in Portugal is therefore unanswerable in the current state of affairs. The way to answer such a question is to find an adequate way of financing a first step towards UBI and then finding a way to finance a second step, and so on[8]. In the rest of this paper I present a way to finance a first step towards UBI.

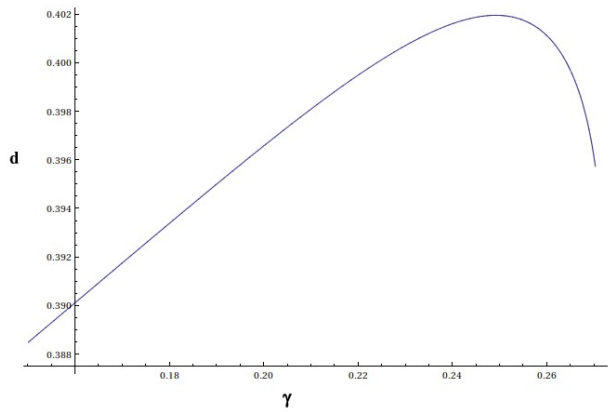


Figure 6: Disposable income (expressed as a proportion of GDP per capita without UBI) as a function of UBI ammount γ (expressed as a proportion of average wage), with parameters *L* and *h* calibrated for Europe, according to Gama (2018).

8 A challenge in this procedure is the existence of nonlinearities regarding the impact of additional income on the bargaining power of workers and its impact on wages. While a small monthly income may already have an empirically measurable impact on this regard, through the income effect, this marginal impact may change substantially when it approaches the poverty line or the national minimum wage. If the unconditional income is 5 or 7 times lower than those values, the path towards UBI would need to continue to be gradual, otherwise any estimation of this second-order effect would be misleading.

4 Gradual implementation

Political support for UBI is far from generalized. Wispelaere (2015) presents some obstacles to stronger support for UBI, among which the non-existence of a big constituency. Regardless of other moral objections to that proposal, many of those who want to participate in the labor market are not *subjectively aware* of their interest in UBI, believing they are net losers under such policy (they would be mistaken, according to Gama's results).

These obstacles are compounded by the *revolutionary* nature of any UBI proposal implemented from the ground up, given the magnitude of economic changes associated (no less than 30% of GDP would be affected one way or the other). While some policy changes, such as the establishment of a National Health Service (NHS), implied a vast economic transformation and were popular nonetheless, they were never as vast (in Portugal the NHS costs about 5% of its GDP) and unpredictable.

A proposal for a *first step* towards UBI could ease the formation of an effective political coalition with that aim. Not only because economic consequences would be less uncertain, dampening the opposition of risk-averse political actors, but also because the main moral objections for the UBI would not be at play if the amount awarded in that first step was low enough. Furthermore, many electors would be *subjectively aware* of their interest in such an income. In fact, while no UBI proposal has ever been shown to find the support of the majority of the population in any country, unconditional incomes such as those implemented in Alaska and Macau have proved to be popular and increasingly popular. In Alaska, a survey conducted in 2017 found that 64% of respondents would rather raise state income taxes than end the Permanent Fund Dividend, a value that has risen from 29% in 1984 (Harstad, 2017)[9].

The proposal regarding the financing mechanism for the *first step* is critical for the formation of the political coalition that will fight for it. A financing mechanism that constitutes good public policy and easily finds enthusiastic advocates would be decisive for the prospects of such a proposal.

9 This suggests that the fact that the marginal impact of such small income on the bargaining power of workers is smaller than it would be for a larger income does not lead to pessimism regarding proposals to increase its value, quite the opposite.

5 Pigouvian taxes

"The scientific evidence is now overwhelming: climate change is a serious global threat, and it demands an urgent global response" is the opening line of the Stern Review (Stern, 2007), the largest and most widely known and discussed report estimating the economic impact of climate change. The review estimates that the damage could rise up to 20% of GDP or more, a value higher than many civil wars. The urgency of policy responses is also stressed by the IPCC (2022): carbon-equivalent emissions must decrease 43% by 2030 if disastrous irreversible impact is to be avoided. Climate change, however, is far from the only environmental challenge that humanity faces: air pollution, water pollution, environment-related industrial hazards, unsustainable natural resource management (such as fisheries) and other forms of biodiversity loss all have significant impacts (OECD, 2008). Steffen et al (2015) presented the planetary boundary framework which strives to provide a science-based analysis of the risk that human perturbations will destabilize the ecosystems at the planetary scale (figure 7). Human activity is below three of the seven boundaries quantified (and therefore safe in that regard), but in the unsafe region regarding climate change and land-system change. With respect to the two remaining boundaries (biochemical flows and biosphere integrity), human activity is operating beyond the zone of uncertainty and it is already causing massive irreversible damage.

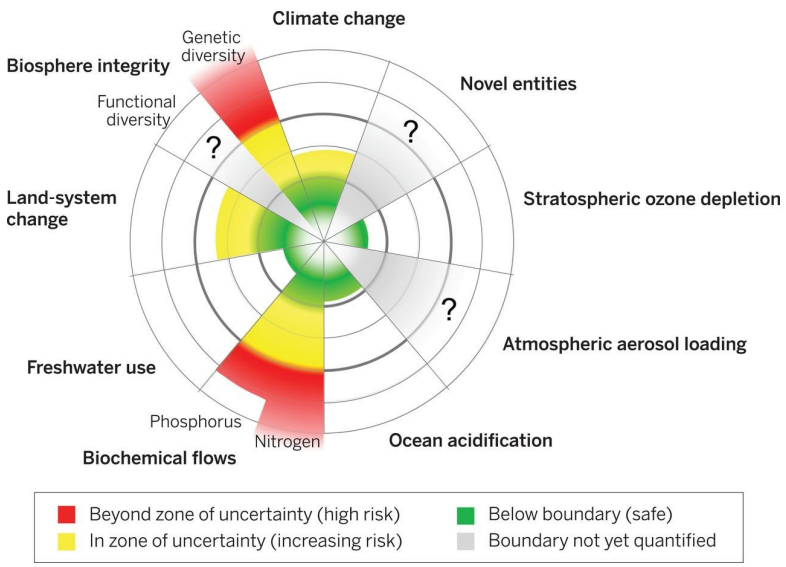


Figure 7: Current status of the control variables for seven of the planetary boundaries (Steffen et al, 2015).

The environmental unsustainability of human consumption in market economies shows unequivocally that there are critical market failures: those involved in transactions do not account for the damages those transactions impose on other agents. Pigouvian taxes have been proposed as one of the most efficient and effective tools to address environmental problems (D'Arcangelo et al, 2022; Jorgenson et al, 2013). They work by "internalizing" the damages transactions impose to third parties, such that transactions with a surplus lower than the damage they create tend not to take place (thereby increasing efficiency and decreasing damages), while transactions with a surplus higher than the damage created become associated with some form of compensation for third parties (thereby increasing fairness). They could change consumers' decisions directly, but could as well change firms decisions and their production processes, by aligning the aim of decreasing environmental impact with that of decreasing production costs.

However, while political support for such measures is scarce, political opposition has frequently been strong and decisive (D'Arcangelo et al, 2022). The Yellow Vests demonstrations are symbolic of how measures of this kind have been interpreted in the framework of city elites versus *blue-collar workers*. A significant proportion of the population considers that these taxes decrease their overall income, and, furthermore, in a way that hurts mostly the most vulnerable. The fact that measures of this kind were accompanied by tax reductions seen to help those better-off (Goodman, 2019) did not make their popularity any favors.

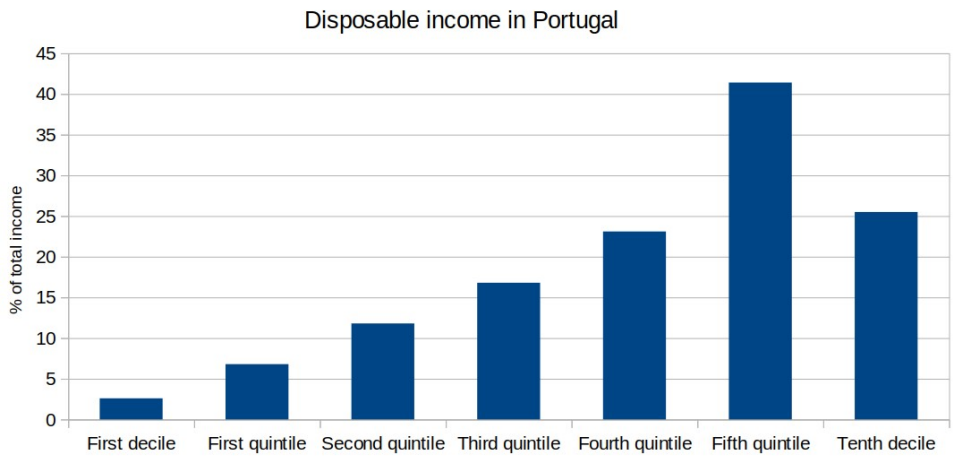


Figure 8: Distribution of disposable in Portugal (Eurostat)

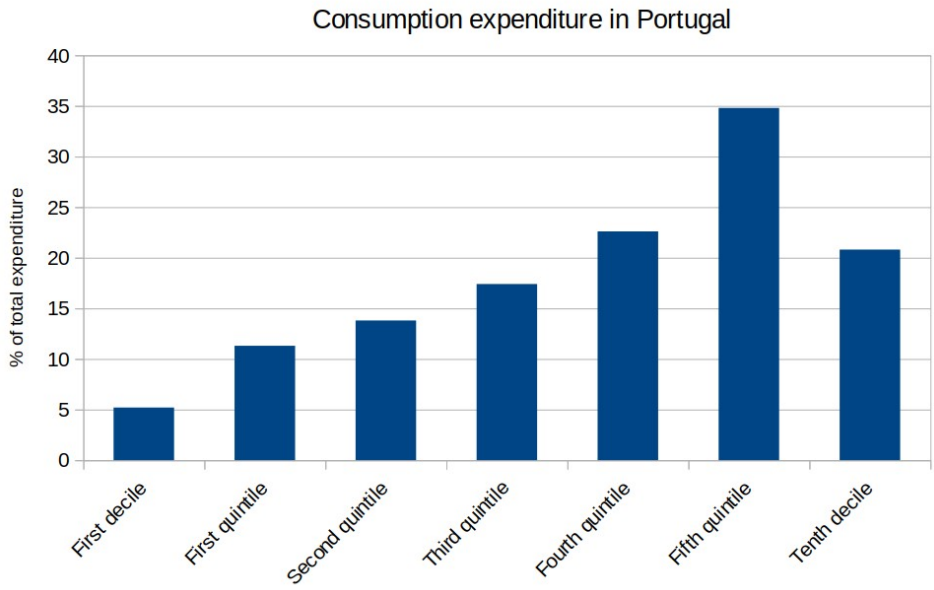


Figure 9: Distribution of consumption expenditure in Portugal (Eurostat)

This would mostly likely change if Pigouvian taxes were not seen as a decrease in income. Opponents of these measures believe they are net losers in terms of real disposable income, and that belief drives their opposition. If such proposals were set up such that most population not only increased their real disposable income but also perceived that increase, opposition would be much smaller. Therefore, if the revenue of these Pigouvian taxes were to be directly distributed to every adult in such a way that the real income of most citizens would increase, the popularity of such proposals could be much higher. Figures 8 and 9 show the distribution of disposable income and consumption in Portugal per income quintile according to Eurostat (2021) data from 2015. To estimate the proportion of households that would increase their income, and by how much, if additional taxes on consumption were to be distributed equally to every citizen, I interpolate linearly[10]. Results are shown in figure 10. I find that 62% of households would increase their income if Pigouvian taxes were to finance an unconditional income, and that those with the lowest income would benefit the most. Using Eurostat values for average disposable income and consumption, I find how disposable income would change if a tax was levied on consumption so as to finance an unconditional income of 50€. Results are shown in figure 11. I find that the decrease in disposable income for the richest house-

10 I also assume the same average number of adults per household across income percentiles.

holds is lower than 5%, being smaller for any other net-loser household. On the flip side, the increase in disposable income for the poorest households would be above 25%.

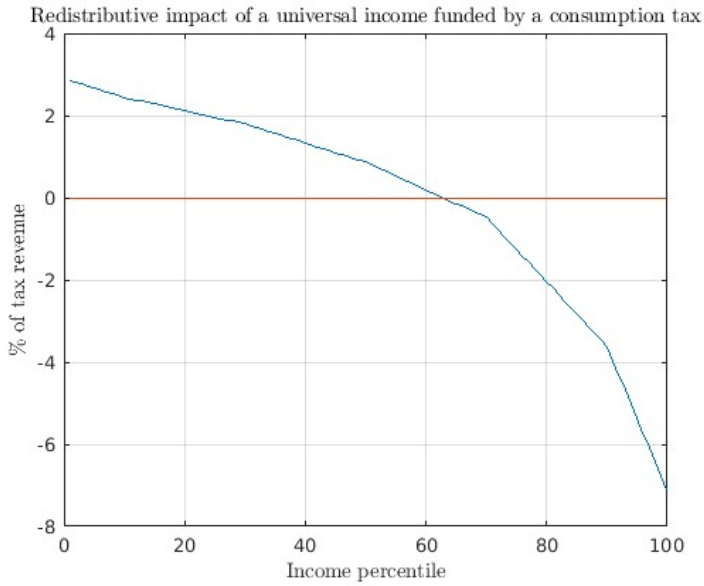


Figure 10: Income transfer (as a proportion of total revenue) by income percentile if an increase in income taxes were to be equally distributed

Such a policy would therefore present three main advantages: it would help decrease the environmental impact of economic activity; it would increase the real income of most citizens;

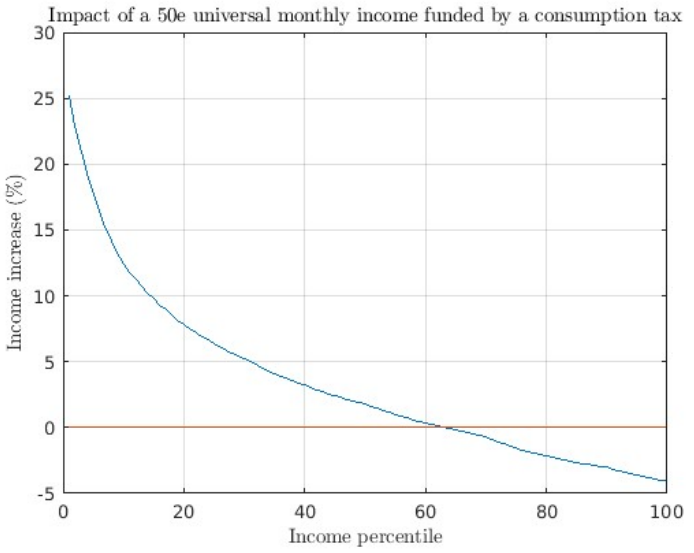


Figure 11: Change in disposable income by income percentile if a monthly Unconditional Income of 50€ were to be financed by an increase in consumption taxes

and it would benefit mostly those with lower incomes, whilst main net contributors would be those with higher incomes. A detailed proposal of this kind, albeit limited to carbon emissions associated with the challenge of climate change and with the income associated subject to taxes, has been presented for the US (Ummel, 2020) and its effects have been studied in detail. Figures 12, 13, 14 and 15 show that: with the exception of households in the first quintile, most households that would lose income with this policy would lose very little (<0.2% of income); household's community type (urban, suburban or rural) almost does not change the impacts; ethnic minorities are favored by this policy; and age groups benefiting the most are the youngest (18 to 35) and the oldest (above 80).

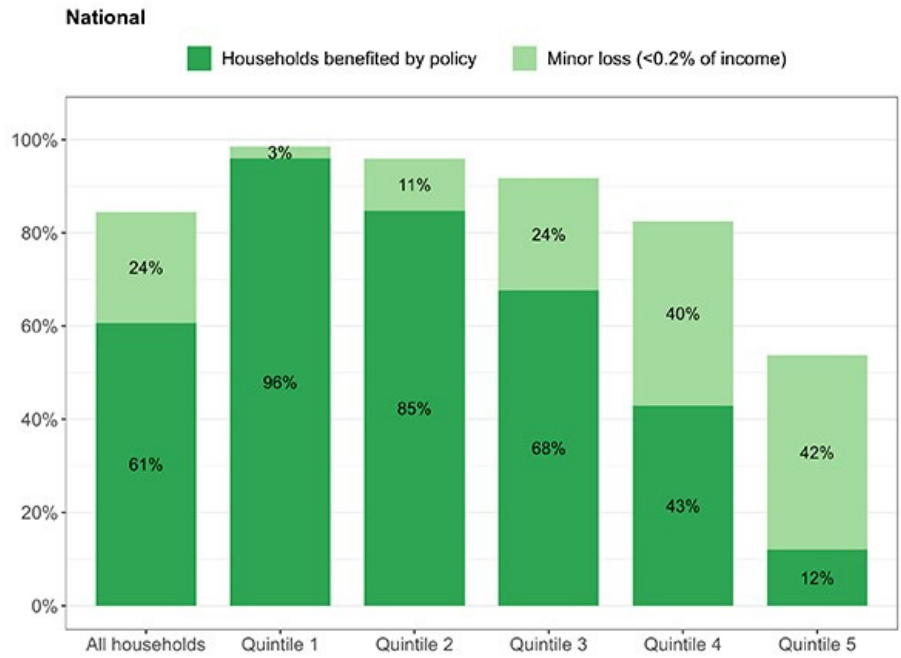


Figure 12: Percent of US households whose carbon dividends exceed carbon costs, ranked by consumption quintile, according to Ummel (2020). The lighter green denotes a "minor loss," defined as less than 0.2 percent of income.

In section 3 I mentioned that consumption taxes were subject to a substitution effect that could decrease income more than the increase in revenue. I am not considering that effect in this setting for two reasons: the overall amount is not high enough (the gross increase in taxes is less than 3% of gross income on average) and, because taxes are not uniform across goods but instead favor those with smaller environmental impacts, they would decrease the deadweight loss cre-

ated by pollution externalities that would more than compensate any loss due to the substitution effect. In fact, if taxes are set up to equate marginal costs imposed on third parties, long-term average income would be higher.

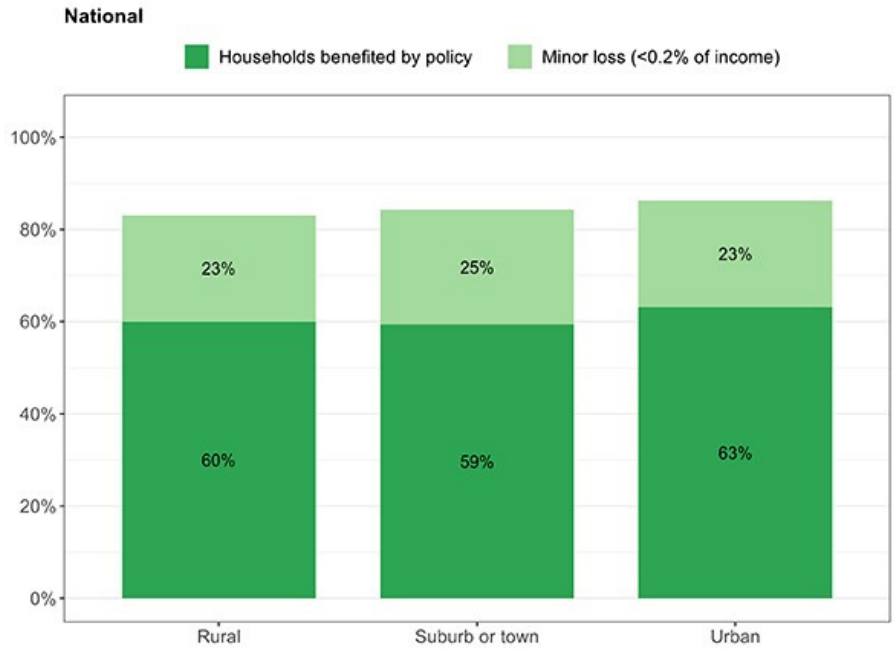


Figure 13: Percent of US households whose carbon dividends exceed carbon costs, arranged by community type, according to Ummel (2020).

6 Estimate for Unconditional Income implementation

The European Environment Agency (Schucht et al, 2021) estimates the external costs of main air pollutants (NH_3, NO_x, PM_{10}, SO_2, NMVOCs), heavy metals (*As, Cd, Cr, Hg, Ni, Pb*) and organic pollutants (benzene, dioxins and furans, PAHs) to be between 80 and 235 billion euros in the EU (which amount to 0.47%-1.37% of the European GDP). The WHO estimates (Prüss-Ustün et al, 2004) that 1.7 million deaths and 4.4% of the burden of disease (BoD) are attributable to unsafe water supply, sanitation and hygiene. According to the report of the Lancet Commission on Pollution and Health (Landrigan et al, 2018), "In 2015, diseases caused by air, water and soil pollution were responsible for 9 million premature deaths, that

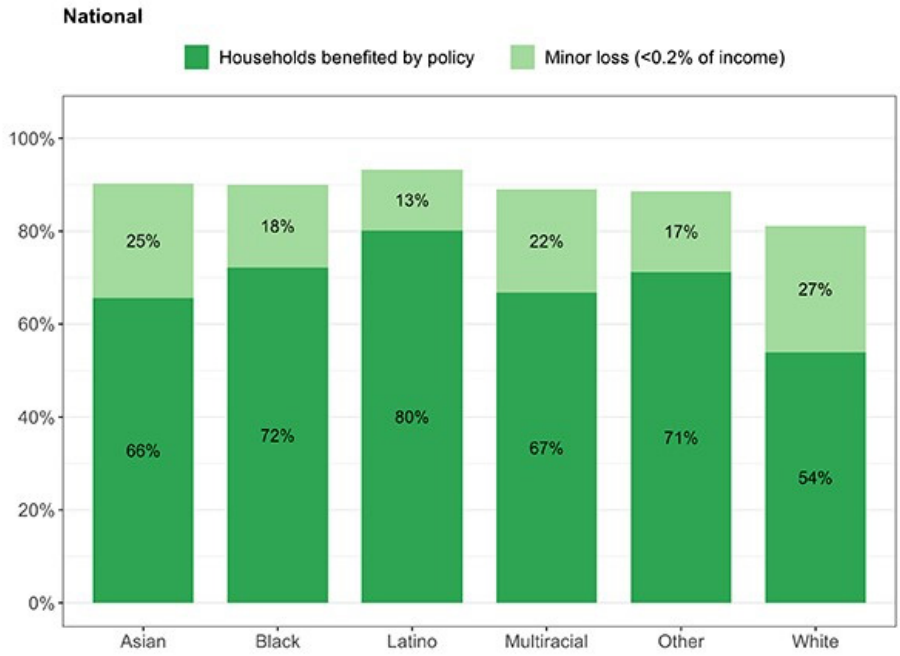


Figure 14: Percent of US households whose carbon dividends exceed carbon costs, arranged by race/ethnicity, according to Ummel (2020).

is 16% of all global death. Exposures to contaminated air, water and soil kill more people than smoking, hunger, natural disasters, war, AIDS, or malaria." According to that report, in high income countries, the welfare costs of unsafe water, unsafe sanitation and lead exposure amount to 0.96% of GDP. According to the OECD (2008), the costs of unsustainable natural resource management (only fisheries and groundwater were studied) in the EU are above 0.44% of GDP. The same report studies the costs of inaction with respect to environment-related industrial accidents and natural disasters, but abstains from estimating any value in spite of stating that damages may constitute between 2% to 15% of GDP and therefore costs of inaction are a major threat to economic development. Brink et al (2011) estimates that the total annual damage related to Nitrogen in the EU ranges between 70 and 320 billion

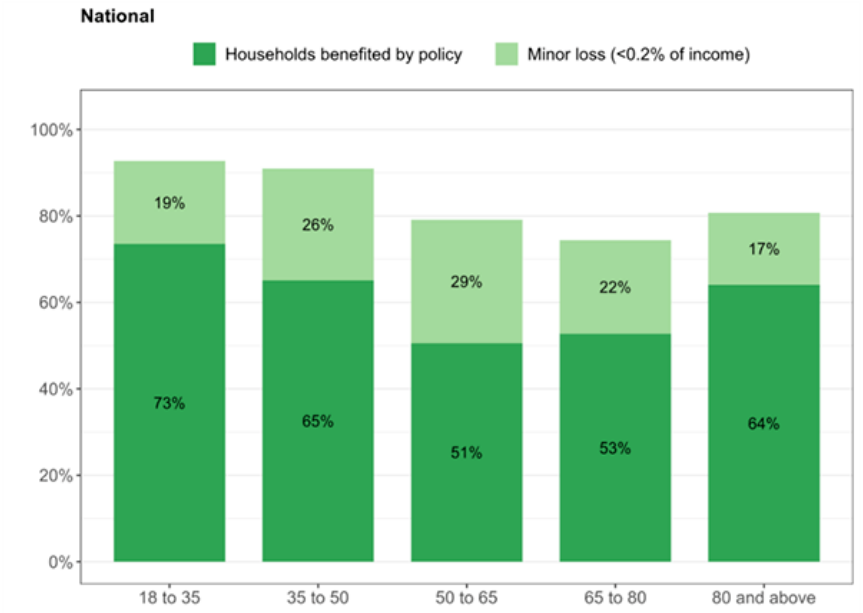


Figure 15: Percent of US households whose carbon dividends exceed carbon costs, arranged by age category, according to Ummel (2020).

euros or 0.41%-1.87% of EU GDP. About 60% of the damage costs calculated are related to human health, 35% to ecosystem health and 5% to the effects on the greenhouse gas balance.

The costs presented in the estimates above include the direct costs, the material property damages, other direct economic costs (business interruptions, added scarcity, etc.), indirect productivity loss, health costs, and total social costs, including the subjective valuation of ecosystem damages. They are by no means complete, as they do not account for the impact of European consumption on biodiversity loss outside the European Union, as well as other damages to outside Europe (water pollution, etc.). This is simply due to a lack of estimates: a complete estimate should include those costs. These costs are summarized in table 5, together with the costs associated with climate change estimated in the Stern Review (2007).

The worldwide cost of 20% of GDP accounts for the fact that developing nations are the hardest hit. While it would certainly be fair for developed nations to compensate developing nations for those damages, any revenue with that purpose could not be used to finance an unconditional income, and therefore I consider the 14% estimate in the Stern Review, instead of the 20% figure. The European Environment Agency discriminated the costs for Portugal and that figure was used, but the other estimates did not. In those cases, the costs were assumed to be an equal proportion of GDP. Regarding

Nitrogen-related damage, I consider the middle point of that range and subtract the 5% related to climate change to avoid counting damages twice.

Table 5: Estimates for environmental damages' costs

	Costs of environmental damages		
Environmental damages	Estimate	Cost in the EU (% of EU GDP)	Cost in Portugal (% of Portuguese GDP)
Air Pollutants	Eionet, 2021	0.47%-1.37%	1.3%
Unsafe water, unsafe sanitation and lead exposure	Landrigan et al., 2018	0.96%	0.96%
Unsustainable natural resource management	OECD, 2008	0.44%	0.44%
Excess Nitrogen	Brink et al., 2011	0.41%-1.87%	1.08%
Climate change	Stern, 2007	14%	14%

To estimate the revenue of a UBI coming from Pigouvian taxes related to environmental unsustainability, an estimate of damages due to the lack of adequate regulation is not enough. Optimal taxes should equate marginal damage[11], and, when that happens, overall tax revenue becomes lower than the total damage prior to those taxes. In fact, the lower revenue becomes - as compared to prior damages - the more effective taxes are at preventing those damages. For most environmental damage presented above I could not obtain information capable of finding the revenue of an optimal tax - even when information regarding marginal costs were available, as was the case with Schucht et al (2021), estimates for the price-elasticity of those emissions were not found. However, due to the lack of a better estimate, I found the ratio between the optimal revenue of a tax aimed at preventing climate change and climate change damages. I then used this ratio to estimate the optimal revenue of taxes aimed at preventing other unsustainable environmental activity.

To estimate optimal tax revenue with respect to climate change, I consider the 2030 climate target plan (European Commission, 2020), which implies, for Portugal, a $r = 53\%$ reduction of today's emissions by 2030. Some considerations regarding this choice: on the one hand states are using

11 A Pigouvian tax imposes on those participating in any transaction the costs borne by third parties. Therefore, the tax on any given quantity to be taxed is equal to the additional damage that quantity causes.

other policy instruments to meet this target, and carbon pricing alone is not required to go as far; on the other hand the 2030 target is still almost twice the sustainable amount of E_s = 15.6*Mt*. This quantity E_s is calculated considering national environmental limits and footprints (Dao et al, 2018) based on the Planetary Boundaries framework and extrapolated considering Portugal's population[12]. This implies that a carbon tax increase capable of meeting the 2030's target will not be excessive regardless of other realistic policies already planned to meet that target, given how far that target is from sustainable values. However, to avoid overestimating the revenue, I assume that a sustainable level of carbon emissions is achieved by 2030 (instead of just the 2030's target) due to other policies aimed at addressing climate change. Notice that, while this assumption is optimistic regarding our capacity to face the challenge of climate change, it is pessimistic regarding the revenue of optimal taxes, therefore providing a cautious lower bound. When computing the optimal tax revenue I use the price-elasticity ϵ (which I assume constant) of carbon emissions that was estimated as 0.25 (Engström et al, 2020). I also consider the current cost cc of a ton of carbon (or equivalent) due to regulations currently in place as 56.6 USD (Engström et al, 2020). Under these assumptions, the revenue T of an increase in carbon tax capable of meeting the 2030's target is given, in million USD, by:

$$T = ((1/(1-r))^{1}/\varepsilon-1)\, c_c\ E_s\,. \qquad (2)$$

This revenue amounts to 3.3% of Portugal's GDP and would, by itself, afford a monthly Unconditional Income of 71.6€ to all adults. It also amounts to 23.6% of the damages estimated in the Stern Review. This allows me to estimate a lower bound for the revenue of additional Pigouvian taxes related to air pollutants, water pollution, lead exposure and natural resource management, that may increase the monthly Unconditional Income in 14.7€. Finally, regarding excess-Nitrogen related costs, the Science Communication Unit (2013) of the European Commission states that, were farmers to pay the costs of nitrogen pollution, their use of synthetic fertilizer would fall by 30%. This information allows me to estimate the revenue of optimal taxes as 0.76% of GDP, which raises the monthly Unconditional Income by 17.7€ for a total of 104.1€.

The Unconditional Income of 104.1€ could therefore be financed by taxes that would help the Portuguese economy be environmentally sus-

12 Other criteria for such rescaling of global limits would lead to even lower values.

tainable and consequently help avoid catastrophic collapse. Figure 16 presents the impact of these Pigouvian taxes on disposable income per income percentile. Results show that, as in the previous section, 62% of households would increase their income. The richest households would lose 8.4% of their income while the poorest households would increase their income by 52.3%. Notice that this does not account for the welfare increase due to the decrease in environmental damages: the households of all income percentiles would stand to gain when I consider cautious estimates of those gains. Due to the lack of available data, these calculations take into account the total consumption value associated with each households' income, but not the kind of consumption. While this could decrease the potential redistributive impact of this unconditional income, Ummel's results suggest this composition effect is relatively modest.

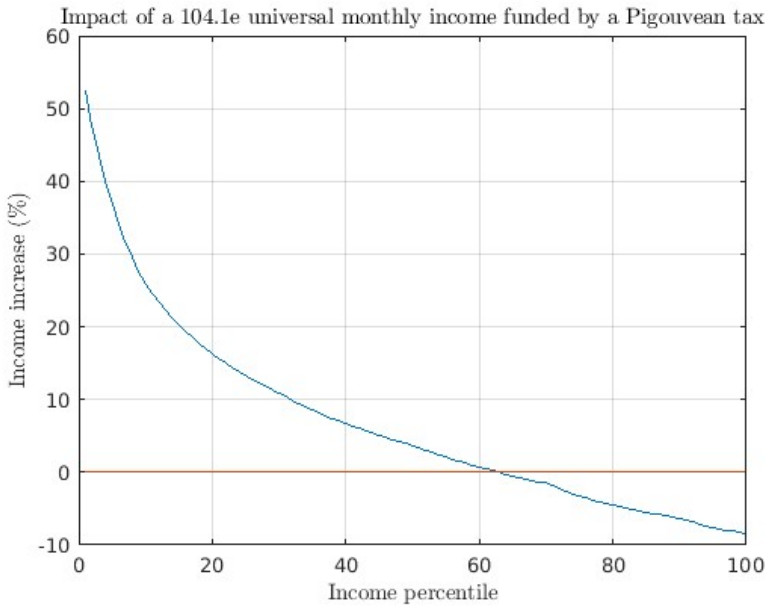


Figure 16: Change in disposable income by income percentile if a monthly Unconditional Income of 104.1€ were to be financed by Pigouvian taxes

Notice that the estimated revenue is not the short-run revenue when consumption has not yet adjusted to new prices, but instead the long-term revenue when consumers' decisions already had enough time to substitute away from consumption decisions with worst environmental impact. In fact, if we consider the extreme case of a short-run price elasticity of zero for the first year, the short-run revenue could be as much as 3.27 times higher, making the financing of a monthly Unconditional Income of 340.7€ possible. To find this value I just multiplied the computed per-unit taxes

by current consumption instead of the equilibrium values. Although one should not expect immediate values for the Unconditional Income to be near these amounts, as some reaction to prices is immediate or takes few weeks or months to adjust (let alone a full year), one should expect this time-evolution dynamic: an Unconditional Income funded by Pigouvian taxes of this kind will decrease initially and converge to an equilibrium value. It might be possible to avoid such a transition if taxes do not assume their long-run values immediately but instead ramp-up at the pace that better stabilizes revenue. This however, limits the capacity of these taxes to address environmental challenges with the urgency they require. There is a trade-off for policy makers to ponder. A three year-ramp may be a time-frame long enough to observe a rise in income while still short enough to be compatible with the urgency of environmental challenges.

If these taxes have such positive redistributional impacts, their cyclicality will have negative redistributional impacts. When GDP decreases, consumption will decrease and consequently the tax revenue and the Unconditional Income amount. The negative redistributional impact of such reduction could compound the negative consequences of crises. Again, policy makers face a trade-off. A fund with the purpose of stabilizing the real income brought by this Unconditional Income may be created[13] and allow this income to be an automatic stabilizer that helps dampen the impact of crises, but that may limit the political appeal of such a proposal: having a direct channel between the Pigouvian taxes' revenue and the Unconditional Income would be key to address the usual skepticism towards taxes of this kind. Such a fund could be proposed and implemented later, after the population got acquainted with such arrangement.

7 Long-term effects and other considerations

The most important long-term effect of this arrangement is the critical contribution to decrease environmental damages. However, for a national implementation such as the one proposed some challenges would remain. Firstly, because imported goods would also face taxes associated with an estimate of their environmental impact, and because

13 The fund would not require any maintenance cost that would increase public expenditure, as the average revenue from the Pigouvian taxes listed and average payments should be the same. There could be several possible solutions regarding funding, ranging from the use of conventional or modified debt instruments to a small proportion of the revenues (which would slightly decrease the UI amount) during the first years of the program.

it is impossible to make a completely objective assessment of those impacts, some foreign firms would inevitably argue the estimates for their products to be excessive, that they were being discriminated and that these taxes violate the free circulation of goods and services across the EU. To avoid litigation, policy makers could be more cautious when evaluating damages associated to foreign firms, but this would hurt domestic firms. The fact that these Pigouvian taxes would also include intermediate goods (so as to have maximum impact in production processes), would hurt Portuguese exporting firms[14]. If other European member-States were to implement national versions of this program, not only would the negative impact of these issues decrease (mostly if some transnational institution was created to estimate the value of taxes for different products for all States with a national implementation of this kind), but the positive environmental impact would be much stronger. A European version of such a program (with a single Unconditional Income based on the European revenue), on the other hand, not only would mostly eliminate these problems but also maximize the positive environmental impact[15]. Furthermore, the proportion of the Portuguese population that would increase their net income in such a setting would be much higher, and the positive welfare effects in Portugal would be tremendous. One could argue that the political challenges of such implementation would be compounded by the skepticism of richer nations with a program that would end up transferring income for the poorer nations of the EU, but that debate is out of the scope of this paper.

While the real amount of an Unconditional Income financed exclusively by Pigouvian taxes was estimated assuming constant price-elasticities, these tend to be lower in the longrun (not least due to the development of new alternatives), which could lead to a decrease in real revenues. Due to practical and political considerations, the list of environmental concerns that the Pigouvian taxes address at the start of the program must be limited, but unfortunately there is no shortage of other issues to be addressed that could approximately maintain

14 One may argue that this would instead help these exporting firms to prepare for the sustainable economy of the future, thereby helping the Portuguese export sector in the long term.

15 Regardless of whether a national implementation (with one or more states) or a European implementation is chosen, changes in trade policy would be advised. Proposals such as Dupré & Leré (2019) to make trade policy compatible with social and environmental sustainability would also ease the challenges of a UI implementation funded by Pigouvian taxes.

real revenues for the foreseeable future. Additionally, even if the real amount of an Unconditional Income financed exclusively by Pigouvian taxes is constant on the long-term, the real amount of an Unconditional Income could change if the political economy changes as well.

While it is by no means guaranteed that citizens would approve increases in this income that would transform it into a UBI, it seems clear that the implementation of a UBI would be less difficult in such a setting. As previously mentioned, a survey conducted in 2017 in Alaska found that 64% of respondents would rather raise state income taxes than end the Permanent Fund Dividend, a value that rose from 29% in 1984 (Harstad, 2017). A tax on land to replace current housing taxes (IMI) would be a promising second step, as those would decrease housing prices if the revenue was to be increased vis-a-vis the current taxes. Such a decrease in housing prices would have positive redistributive effects and would also decrease the frequency and severity of financial crises.

Increases in the Unconditional Income amount financed both by taxes on capital and labor could, in the short term, increase the net income of labor-market participants, and therefore leave most population better-off. Taxes on capital would do it directly while taxes on labor income would do it through the wage increase as a consequence of labor supply driven by the income and substitution effects (Gama, 2018). In the long term, however, the effects of this policy on the capital stock, and consequently on wages, are uncertain at best. The relation between the issue of UBI and the issue of disruptive automation is better understood when considering the interconnectedness between capital, labor and UBI amount. We can understand disruptive automation as an abrupt increase in total factor productivity in a society where demand will take time to adjust to supply; thereby creating an oversupply of labor. In such an environment, UBI would lead to much better outcomes than its absence, both by decreasing the supply of labor (which would increase wages) and by increasing demand for goods and services (wich would increase returns on capital).

Frey & Osborne (2017) examined expected impacts of future computerization on US labor-market outcomes. According to their estimates, about 47 percent of total US employment is at risk. They further argue that their results underestimate the employment at risk, as their method does not estimate second order effects (for instance, less managers and administrative personnel being required due to the automation of other jobs).

These estimates are in line with other predictions about the economic effects of automation (McAfee & Brynjolfsson, 2011). Several economists doubt automation will have such an impact on employment and even on productivity. Antolin-Diaz et al (2017) show that longterm labor productivity has been slowing down in Western countries since the 1960s, without any signs of reversing the trend. Employment has not shown a long-term decrease in the last two decades and some argue it will not be harmed by automation at all (Autor, 2015). There is no consensus among experts about the future impacts of automation, and I do not take a stand in this debate. I do however notice that the implementation of an Unconditional Income would leave society more prepared to address such a disruption if it were to take place.

Even if technology does not present such a disruptive impact, there are grounds to increase the Unconditional Income. During the first industrial revolutions, workers and trade unions fought hard to limit daily working hours (firstly to 12 hours per day, then 10 hours per day, and later 8 hours per day), to implement weekends, paid vacations and paid retirement (Foner, 1987; Guerard, 2018; Podmore, 1907), and all these have effectively limited labour supply. There is a social consensus that societies are better off by having implemented all these restrictions on labor supply. This belief is strengthened when we consider Komlos' data on English and European heights during 1760-1860 (Komlos, 1998; 2005). The first three/four decades of the Industrial Revolution were accompanied by a significant height decrease that finds in overall malnutrition its most likely explanation. The limits to labor supply, on the other hand, have been followed by a continuous and long lasting increase in height. However, the solutions used to limit labor supply during the Industrial Revolution may be insufficient when applied to an economy where industrial production itself only accounts for 27% of GDP - as it does in the world economy (The World Bank, 2018) - or about 20% - as it does in most Western countries. Many of the goods and services produced in today's economy do not require the presence of the employee in the workplace, and further limits to their work schedule frequently mean more work during their supposed leisure time (Golden, 2015). The workload in an ever growing share of the economy is determined by work targets set by employers, and the amount of time spent in achieving them is unenforceable by the authorities. Employers who do not set objectives that surpass the workload which can be completed within the time spent in the workspace are at a competitive disadvantage, and thus new ways of reducing labor

supply are required if they are to be effective. If the income and substitution effects of UBI lead to a decrease in labor supply, UBI may present an additional instrument to better regulate labor in such an environment. Positive externalities of leisure (Bilancini & D'Alessandro, 2012; Pintea, 2010) offer additional grounds for the use of such a policy instrument.

While the implementation of an Unconditional Income may allow for better estimates of any similar gradual increase on the same scale, when it comes to the effects of a complete UBI, pilot-experiments may provide invaluable information. There have been some relevant experiments of this kind, but none thus far in Portugal. A pilot experiment would lead to a better evaluation of impacts required to estimate second-order effects of UBI and to design adequate financing mechanisms. Even if an Unconditional Income is implemented, it is hard to believe it could ever become a UBI without such experiments being properly studied in the first place.

8 Conclusions

I proposed a implementation of a UBI in Portugal under the same assumptions used in previous works, albeit with some added benefits, such as avoiding a decrease in net income for pensioners due to consumption taxes as in Castro (2018), or presenting a balanced mix of tax revenues with higher welfare impacts, as opposed to Teixeira (2019). This proposal maintains an important limitation of previous works: it does not estimate second-order effects. In fact, I do agree with Castro and Teixeira in considering any such attempt with current information as speculative at best.

I argue that any UBI implementation should start with a smaller, less impactful, Unconditional Income, which, together with results from pilot experiments, would allow better estimations of future rises. I advance the study of UBI implementation in Portugal by presenting a specific proposal for such a *first step*: an Unconditional Income financed by Pigouvian Taxes. I find that such a proposal would help face humanity's environmental challenges while at the same time increasing the disposable income of 62% of Portuguese households. Furthermore, for this Unconditional Income estimated in 104.1€, the richest Portuguese households would face a 8.4% decrease in their income while the poorest would face a 52.3% increase. I discuss the long-term effects of this proposal and how to bridge it with a future UBI implementation.

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