Efficiency or redistribution? An empirical study of the implications of VAT design

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Abstract

A structure of differentiated rates has traditionally been the preferred instrument by policymakers to mitigate the regressive impact of VAT on low-income families, who tend to allocate a higher share of their budget for final consumption in relation to high income families. The question that arises however is whether there exists a better alternative in terms of the redistributive impact when considering a fully developed tax system encompassing more suitable forms of direct taxation (Mirrlees, 2011). The nature of VAT acts as an indirect mean of redistribution, and in this sense, the presence of unpredictable and heterogeneous preferences and needs may affect the original redistributive impact of a differentiated tax structure, if the fragmentation of the rates results in an excessive dispersion of the desired effect around the average tax schedule. By decomposing the overall redistributive effect of VAT into a vertical and horizontal component of taxation (Aronson et al., 1994; Lambert and Ramos, 1995), the analysis shows how the existing Italian three-rate structure does not represent the best alternative in both redistributive and efficiency terms. More specifically, given the same increase of revenue expected for 2018, a homogenous two-rate scenario would generate a higher vertical redistribution whilst minimising the horizontal inequality arising from the presence of individual tastes and needs.

Introduction

The design of a tax system and the modelling of tax reforms are always the result of a trade-off between revenue objectives and distributional concerns which policy makers face. The balance between these two targets defines the scope of tax intervention and requires adequate methods to assess the overall efficiency of the preferred tax system in achieving its goals. The research presented in this work focuses on the design of the Value Added Tax (henceforth VAT) for the case of Italy. In particular, the analysis critically questions the effectiveness of the current Italian VAT structure in achieving its desired redistributive aim. Alongside, the study shows the opportunity of alternative scenarios of reform in terms of both tax efficiency and redistributive contribution. All in all, the work provides further evidence on how the current Italian VAT system does not represent the best available alternative, given the goals of the legislator and the existing European framework in terms of fiscal harmonisation and government expenditure constraints (Patrizii and Rossi, 1988-1993; Gastaldi and Liberati, 1998; Liberati, 2001; Gastaldi et al., 2014).

From a theoretical and empirical perspective, the process of assessing the redistributive impact of forms of indirect taxation is not particularly straightforward. Contrarily to the case of direct taxes, where the impact of taxation is captured on "immediate" measures of the ability to pay of taxpayers (i.e. income), in the context of indirect taxes - as VAT - the redistributive impact of taxation is not only determined by the levels of the tax base (i.e. expenditure in final consumption) but is also affected by the presence of heterogeneous tastes and needs, originating from an underlying distribution of individual preferences which is *per se* arbitrary and not quantifiable by the legislator in the design of the tax. In this sense, VAT is ultimately an indirect mean of redistribution and this is why the differentiation of rates is employed to address distributive concerns (Boeters et al., 2010).

In principle, in a benchmark scenario of a uniform VAT rate across all final goods and services there would be no redistributive effect. Redistribution is introduced in the system once the VAT regime is differentiated among commodities through the application of different tax rates. Technically, such redistributive effect would be maximised if individuals had homogenous preferences, as the distributional impact of the tax would depend on the levels of consumers' expenditure and not from their final choices of consumption. Evidently, individuals do present different preferences and needs, whose behaviour is rather unpredictable and arbitrary. This ultimately generates some degree of noise in the desired redistributive outcome, which may

result in a dispersion of the distributive impact of the tax amongst taxpayers who should be instead eligible of a similar tax treatment.

Especially in the case of a highly fragmented structure of VAT rates - as in the Italian case - it is expected that the redistributive impact of VAT would be distorted, or even significantly reduced, by the existence of individual tastes and needs. This casts some doubts on the opportunity to maintain such a differentiated system instead of opting for a more efficient uniform structure.

In order to investigate this point, the analysis adopts the methodology developed by Aronson et al. (1994) and Lambert and Ramos (1995, 1997a), which allows to decompose the redistributive effect of VAT into a vertical and horizontal component of taxation, where the former relates to the progressivity arising from the effective tax schedule and the latter captures the differences in terms of tax treatment associated to arbitrary characteristics of individuals. The overall redistributive effect of VAT is then determined residually as a difference between these two components, where the horizontal effect acts to reduce the vertical redistribution of the structure of rates. Through this approach, the research shows how in the case of Italy the migration towards a two-rate VAT system would achieve a better redistributive outcome whilst minimising the noise associated to the presence of heterogeneous individual preferences. This result provides further empirical evidence on the convenience to reform the existing VAT system towards a different direction than the one recently approved by the Italian parliament. Not less importantly, the proposed two-rate VAT structure would also have the advantage to be aligned to the European guidance in terms of fiscal harmonisation and, from a theoretical perspective, it would favourably enhance the original properties of neutrality and simplicity which represent the main pillars of the efficiency of the design of VAT. Finally, the analysis highlights how traditional incidence-based approaches fail to measure the full redistributive contribution of VAT, as these methods are unable to account for the presence of heterogeneous preferences of consumptions.

Overall the research provides evidence of how the heterogeneity of individual tastes and needs may reduce the redistributive potential of VAT when this is pursed through the differentiation of VAT rates. The underlying reason being the increase of horizontal inequality associated to the process of taxation set up by the (unnecessary) fragmentation of VAT rates. Not less importantly, the research supports the thesis expressed by a number of authors (Cnossen, 2002; Crossley et al., 2009; Decoster et al., 2010; Crawford et al., 2010; Lejeune, 2011; Mirrlees et al., 2011) on relying on more appropriate forms of (direct) taxation to improve the overall progressivity of the tax system, leaving to the design of VAT the role of achieving revenue efficiency.

The work is structured in three chapters. The first chapter outlines the context of the analysis and the principles of tax design which have been used to develop the scenarios of VAT reform. The second chapter reviews the methodology adopted for evaluating the redistributive impact of VAT and the distortion arising from the existence of different individual tastes and needs. The last chapter presents the empirical results of a micro-simulation of the proposals of VAT reform for the Italian tax framework of 2012.

1. The design of VAT

In the past years, many European countries have been facing the daunting task of addressing the impelling deficit constraints required by the EU regulatory framework. In the present context of low growth, a "forced" solution to this restraint results in policy makers having to find alternative ways to increase the tax revenue, given the limited room of conventional methods of taxation to satisfy deficit spending. Voices have re-emerged stressing the need to implement comprehensive reforms of the single state tax systems, and a wide debate has surfaced on how best to design the overhaul of the present structure. The predicament stems from the necessity to jointly address revenue objectives and redistributive concerns without hampering economic growth in the short-run.

Under these premises, a strong economic argument, which is eagerly supported by several European Union guidelines (European Commission, 2013), ponders on the idea to shift the weight of taxation towards indirect taxes (OECD, 2007; Lejeune, 2011; Bernardi, 2013; Gastaldi et al., 2014). This change in the composition of the tax revenue side of government budgets will enable policy makers to achieve their revenue targets in an efficient manner, and at the same time to rely more on the progressive structure of direct taxation for redistributive concerns. In this context, a consistent economic analysis of the alternative scenarios of tax reform must also evaluate the impact in terms of growth and equity of the various proposals in the distinct tax systems within the EU. More importantly, a tax shift can also stimulate growth if the higher (and not distortive) revenue due to the broadening of the indirect tax base is used to subsidise a more redistributive structure of the personal tax (Bernardi, 2013).

Under these considerations, the most appropriate choice of indirect tax seems to be a tax levied on the value added of final consumption, namely VAT. A tax designed to levy only on the final consumer would avoid distortion in productive allocation as, for the way VAT is designed, it just targets the added-value generated over the production process. More importantly, compared to other forms of indirect taxation, taxing final consumption would minimise the distortion in consumption choices, especially in the context of a uniform rate scenario. That would be associated to gains in revenue efficiency as VAT is designed to incentive tax subjects to declare their tax liability and all final consumers would bear the burden of VAT. Other forms of tax on transactions would fail to maintain neutrality in consumption and production choices. On the same line, given their constrained ability to raise revenue and their different economic aim, it is not possible to exclusively rely on the structure of excise duties in generating significant financial margins for more comprehensive tax reforms.

It is then important to understand how VAT can be employed to reach the aims of policy makers and what the limits of such form of taxation are. VAT is optimally designed to target final consumption through a uniform-rate structure, however a structure of differentiated rates has generally been adopted to mitigate the regressivity of the tax, which tends to levy more on low-income taxpayers who allocate a higher share of their annual income into consumption. This is an intrinsic consequence of any form of tax on final consumption as low-income individuals tend to have a lower propensity to save. However, it has been questioned (Cnossen, 2002; Boeters et al., 2010; Lejeune, 2011; Mirrlees et al., 2011) whether the existence of reduced rates of VAT represents *de facto* (1) an efficient solution to soften the impact of VAT on taxpayers who are less able to contribute and (2) a valid alternative to reach redistributive goals given the existence of other tax means. That is, given the nature of VAT, it is imperative to identify whether the current VAT structure and the prospective trends of reform would best serve the needs and the aims of the policy maker.

In the case of Italy a structural reform of the VAT scheme may be conceived as a starting point for a broader renewal of the whole tax system. In the past years, Italian governments have often made use of increases in the standard VAT rate as a budget safeguard clause to enable policy making given the financial constraints set by the Maastricht agreement[1]. That is still the case under the current budget provisions for 2015 and, if this trend continues, Italian taxpayers may bear by 2018 one of the highest standard VAT rate of the whole European Union. Such a proposal of increasing the existing VAT rates is mainly dictated by revenue concerns. However, the present work questions whether the broadening of the VAT tax base and the removing of the current intermediate VAT rate may better support the system in the direction of a more transparent and efficient structure, which would bring desirable benefits in terms of non-compliance and allocation of tax resources.

For this purpose, a historical overview of the VAT scenario in the European framework is first introduced. Then a theoretical discussion on the scope and limits of VAT design is provided, followed by a brief review of the methods of analysis traditionally employed in evaluating the redistributive impact of VAT and giving a critical emphasis on the choice of measuring this impact through the incidence of VAT on income. Finally, a critical investigation of the economic rationale behind the current structure of differentiated VAT rates is proposed together with an introduction of the reform scenarios explored in the work.

[1] The Maastricht agreement set the economic and financial criteria for countries to enter the European Union. More specifically, these criteria relate to price stability (e.g. inflation rate), public finance (e.g. deficit and debt thresholds) and the control of interest and exchange rates.

1.1. The VAT scenario

The Value Added Tax, namely VAT, is an indirect form of taxation levied on final consumption by taxing the added value generated through the production process of a good or service. For the way the tax is designed, VAT is charged through each stage of the production process but it is effectively paid at the end of the chain by the final consumer, who legally bears the burden of the tax. More specifically, registered VAT traders (e.g. producers and retailers) are entitled of a full refund for the VAT paid when using goods or services as inputs of production. This implies that the tax cumulated during the production chain is transferred to the final consumer in the form of an increase of the final selling price. In reality, the extent of how fully VAT is translated into the final price depends on a set of economic conditions (as for instance the competitiveness of the market) but, effectively, a part of the burden of VAT will effectively fall on firms.

VAT can either be applied at a uniform rate across all commodities produced or, as for the case of Europe, different rates can exist depending on different categories of goods and services. In particular, reduced rates or exemptions have generally been designed with the aim to lessen the burden of VAT on specific groups of consumers or typologies of consumption. However, the uniform VAT rate scenario is generally taken as a benchmark for analysis as it preserves the original properties of efficiency and neutrality of the design of this tax. Finally, the mechanism through which VAT is enforced in each stage of the production chain is designed to deter non-compliance, as firms have an incentive to self-declare the VAT paid for the inputs in order to recover the credit of VAT accumulated during the production process.

VAT was initially conceived in 1920s in Germany but its first application resides in France around 1954 (Ebrill et al., 2001). The adoption of VAT has started to become a mandatory requirement for European membership from 1967 following two European directives (67/227/EC and 67/228/EC). VAT is nowadays a key source of revenue for the EU state members, expression of a more global shift from direct taxation toward indirect taxes (Lejeune, 2011).

The VAT directive (2006/112/EC) dictates the upper- and lower-bounds of the VAT rates that should be applied by EU state members, leaving to the legislation of each state some arbitrary judgment on the final rate(s). In the case of the standard VAT rate, the range may vary between 15 and 25 percent while the minimum rate cannot be below the 5 percent and it is applicable to a list of commodities outlined by the Directive (Italy belongs to the list of previous exceptions and, in this sense, it is allowed to maintain its original 4 percent rate). The Directive also provides the criteria for the applicability of exemptions and the regulatory framework of

internal trade via the destination principle. VAT has historically been a tax widespread across the European territory (see Table 1.1). However, all the countries who recently adopted VAT instead of a sale tax (e.g. U.S.) have mostly opted for a uniform rate structure (e.g. Australia, New Zealand, Singapore, Thailand and Lebanon).

As for the rest of Europe, the implementation of VAT for the Italian case starts from a plurality of rates which led in 1994 to a four-rate structure[2] with the (current) reduced rate of 4 percent, two intermediate rates of 9 and 13 percent respectively and a standard rate of 19 per cent. In 1995 and 1997 the system experienced two reforms of VAT which, together with an increase of the standard rate in 2011 and 2013, ultimately led to the current three rate structure of 4, 10 and 22 percent (see Table 1.2).

This increasing trend of VAT rates is part of a more general context of high fiscal burden for Italian taxpayers. For 2012 OECD statistics (2014) ranked Italy amongst the 5th of OECD member countries in terms of tax burden ratio with respect to the GDP (42.7 percent against the OECD unweighted average of 33.7 percent), only after countries which adopt radically different welfare systems (Denmark, Belgium, Finland – excluding France). Still with respect to the OECD average, Italy depends more in terms of revenue from direct taxes (+2 percent) whilst making less use of indirect taxation (-7 percent). Despite the increase of VAT rates experienced in recent years, VAT accounted only for the 14 percent of the Italian tax revenue in 2012, below the OECD average of 20 percent. This is mainly due to the presence of wide VAT exempted and reduced rate categories, as in 2014 Italy' standard VAT rate of 22 percent was well above the OECD average of 19.1 percent.

In the recent Italian parliamentary debate regarding the policy prescriptions for 2015, an increase of the VAT rates has been included as a budget safeguard clause. This implies that, in the circumstance that Italy does not fulfil the Maastricht criteria required by the European Union for the coming years and given the same budget constraints, the intermediate VAT rate may be increased up to 13 per cent by 2017 while the standard rate may rise from 22 to 25.5[3] percent by 2018. This type of safeguard provision has already been employed previously with the same idea of providing margins for policy makers. For this reason, from 2011 until 2013, the standard VAT rate has been progressively raised by 2 percentage points, leading to the current rate of 22 percent. In this sense, one of the aims of the present work is to explore possible

[2] For simplicity of comparison exemptions will be excluded from the count of rates. However, it is important to keep in mind that the Italian VAT structure enables exemptions and these should be considered *de facto* as another additional rate of the system.

[3] This means that Italy is currently proposing to adopt the higher VAT threshold outlined by the EU Sixth directive which, at the moment, is only adopted by Denmark.

alternative trends of reform for the Italian case, trying to shed some light on why the approach followed so far should not be considered an optimal choice given the aims in terms of revenue and redistribution of the policy maker.

In this historical and legal framework, it is important to point out how, for the case of Italy, some prior contributions regarding the redistributive impact of VAT design have progressively supported the adoption of a less fragmented VAT structure and the harmonisation with the European guidelines. In one of the earliest work, Rizzi (1981) finds a slightly progressive effect (with respect to both households' income and expenditure) for the Italian VAT structure in 1981. This redistributive effect of VAT seems largely differentiated across types of household, mainly depending on differences in expenditure patterns within subgroups and on their share of expenditure in more inelastic commodities. Later on, Patrizii and Rossi[4] (1993) and De Vitiis and De Nicola (1996) show the effect of a redistributive and revenue increasing VAT reform in line with the European harmonisation guidelines and demand of more transparent international competitiveness[5]. Their results were subsequently supported by the work of Gastaldi and Liberati (1998), who evaluate the convenience of migrating towards a two rate VAT structure through an assessment of the redistributive effects of Italian VAT reforms in 1995 and 1997. More generally, the authors provide evidence of how a two-rate structure could have improved the social welfare, given the same revenue obtained from the two reforms[6]. By exploring the distributional characteristics of goods and services subject to VAT, Liberati (2000) also argues how the trends of reform for VAT experienced in the period 1988-1997 have generally worsen the redistributive purchasing power of VAT. This casts some further doubts on the appropriateness and effectiveness of those past reforms and on the economic rationale behind them. In a subsequent work, Liberati (2001) reviews the distributional implications of the VAT reforms for Italy in 1995 and 1997. Even in this case, the shift towards a two-rate structure seems preferable, in redistributive terms, to the revision which led to the current three-rate VAT structure. More recently Gastaldi et al. (2014), using integrated income and expenditure data for Italy, show how the present VAT system does not optimally target its original redistributive aim. In particular, compared to the current scenario, their results point out how a

[4] More specifically, this work adopts a mixed approach between the representative agent model and the aggregation of preference method: an almost ideal demand system. The assumptions underlying this model are of a partial equilibrium model based at a household level (family seen as the centre of consumption decisions), inter-temporal separability (household expenditure is pre-determined and does not change with price), constant production costs (full translation of the tax on final prices uniformly across sectors), and finally that the variation of indirect taxes does not affect the revenue from other taxes.

[5] The simulation proposed by De Vitiis and De Nicola (1996) is based on the assumption that the food expenditure share of a family can be considered a good proxy of the household wellbeing. That is, families with similar budget shares on food expenditure are supposed to have the same level of wealth, independently of the family size.

[6] In order to measure the welfare effects of such proposal of reform they adopt the theory of Marginal Dominance with first round effects. This approach will be subsequently extended into a Sequential Marginal Dominance one by the work of Cepparullo et al. (2012) regarding the impact of inflation on Italian household.

migration towards a two-rate structure may be designed to increase not only the efficiency of the system but also preserve its redistributive power. Not less importantly, they argue how the estimated regressivity of the Italian VAT is in part dependant of the measures adopted. Lately, in his general overview on the reform scenarios for taxation on expenditures in Italy, Tyson (2014) argues how a multi-rate VAT scenario is still not the best alternative to achieve redistributive aims given the high compliance gap, the large loss of efficiency in the revenue collection and ultimately the possibility to address these policy objectives through other means.

For the European case, Copenhagen Economics (2007) explores the economic potential of VAT reforms within 27 member states. Through a general equilibrium model, the authors analyse the interaction between market sectors and the impact of changes in VAT among different stakeholders (e.g. consumers, producers, competitors). Overall, the study finds convincing results in adopting a uniform VAT rate across state members mostly in terms of efficiency and compliance costs, with some exceptions for the case of DIY[7] work and some local supply sectors as tourism. A similar approach has been adopted by Boeters et al. (2010), who find how in the German case a uniform VAT scenario can be distributionally-improving if accompanied by reductions in income tax or social contributions. Alongside, Bye et al. (2011) show how a uniform VAT rate applied to all goods and services would increase the overall welfare by generating higher production efficiency for the Norwegian case. Oliva (2013) investigates the 2012 reform of the VAT structure in Spain through a Gini-income net elasticity approach. The work provides evidence on how the increased gap in the legal VAT rates reduces the progressivity of the system. On the same line, Kaplanoglou and Newbery (2004) look at the redistributive impact of the VAT reform in Greece completed in 2002. By applying the theory of marginal tax reform, they show how the redistributive power of the system has been slightly shrunk by the reforms pushed by the European Union if compared to the 1988 scenario. However, a higher level of VAT uniformity is likely to have reduced the quite high administrative costs of the Greek system, so that overall the changes in the VAT structure can be welcomed from both a redistributive and efficiency point of view. Finally, Mirrlees et al. (2011) outline some proposals of reform for the case of the United Kingdom, showing how a migration to a more uniform VAT rate system would improve the progressivity of the overall tax system by allocating more revenue for a more progressive structure of the income tax.

[7] Do-It-Yourself activities.

Table 1.1. The structure of VAT rates at the 13th of January 2014

State	VAT rates			
	minimum	intermediate	standard	exemptions
		%		
UK	-	5	20	0 + ex.
GER	-	7	19	0 + ex.
ITA	***4***	***10***	***22***	***0 + ex.***
ESP	4	10	21	0 + ex.
FRA	2.1	5.5/10	20	0 + ex.
GRE	-	6.5/13	23	0 + ex.
AUS	-	-	10	-
NZL	-	-	15	-
USA	-	-	-	-

Source: European Commission (2014), Australian Taxation Office, Inland Revenue Department

Table 1.2. Evolution of the structure of Italian VAT rates since 1994

VAT rate	1994	1995	1997	2011	2013	2016	2017	2018
			%				%	
minimum	4	4	4	4	4	4	4	4
intermediate	9, 13	10, 16	10	10	10	***12****	***13****	***13****
standard	19	19	20	21	22	***24****	***25****	***25.5****
exempted	yes	yes	yes	yes	yes	yes	yes	yes

Commodities and VAT rates for 2014	
exempted	mostly health and education services
reduced (4)	essential goods as food, newspaper, etc.
intermediate (10%)	touristic services, some categories of house maintenance and food
standard (22%)	applicable to all other goods

Source: European Commission (2014), Liberati (2001)

** provisions under the saveguard clause for the Italian budget estimates (i.e. Legge di Stabilità) for 2015*

1.2. VAT design: the benefit of a uniform structure

The general scope of tax design is two-fold. First, taxation is the way governments collect resources for policy making to achieve a set of socio-economic goals[8]. Second, as every tax has the effect of reducing the welfare of those who effectively bear the burden, a tax system should be designed in order to minimise the individual loss whilst maximising the social welfare obtained through government intervention. That is, the ultimate aim behind the design of a tax system is to reach the desired distributional outcome of the policy maker whilst not deterring economic incentives and minimise distortions. It is imperative to determine what principles should drive a tax system under the above premise and, not less importantly, how economic theory defines a good tax system.

[8] In other words, the maximisation of tax revenue is not *per se* a socio-economic objective of the policy maker.

In theoretical terms, an optimal tax system is the one that best achieves the objectives of taxation given a set of constraints. In practice, *given the existing tax structures and the difficulty of carrying out effective reforms*, the optimality of a tax system resides behind the trade-off between revenue efficiency and desired redistributive outcome. In this sense, the present work does not follow a purely theoretical approach of optimal taxation, as the ultimate aim of the research is to define provisions for the design of optimal reforms, with particular reference to the case of VAT. That is why, under these premises, the design of a good VAT system should then be consistent with the following set of principles (Mirrlees et al., 2011).

Firstly, a good VAT system should be *transparent* in order to reflect the economic rationale behind the design of the tax. A transparent process of taxation tends to reduce non-compliance behaviours by making taxpayers aware of the policy objectives behind the decision of collecting revenue. For instance, a highly fragmented structure of rates reduces the overall transparency of the system when the diversification of the VAT regime relies on ambiguous criteria. Secondly, VAT design should take into account the *fairness* of the distributional process generated by a tax. A tax system is more likely to be acknowledged by taxpayers if the burden of taxation is perceived as fair. Contrarily to the uniform case, strongly differentiated VAT systems can generate perverse incentives and can discriminate taxpayers on the basis of purely personal needs and preferences of consumption. Not less importantly, when the VAT system is also transparent it would be more straightforward to capture (and verify) the policy aim behind the imposition of the tax, especially when this is combined with a transparent management of public expenditure. All in all, this would allow a better targeting of medium-long term policy objectives as taxpayers are better aware of tax implications, especially when the distribution of the burden within the system is relatively *stable* over time. Still, the concept of fairness does not only refer to the process itself but it also considers how the design of a tax should result in equal treatment for similar taxpayers (i.e. horizontal equity). More specifically, the vertical redistributive action of a tax should be designed in order to prevent discrimination among taxpayers who should be considered eligible of the same tax treatment.

Thirdly, the way VAT is enforced within the system should be framed in order to *minimise administration and compliance costs*. As governments generally suffer from a lack of information regarding the existing tax base, the adoption of a simple and generally neutral tax system overall results in lower administration costs. Differentiation of VAT rates increases the cost of tax collection and it raises incentives for non-compliance when the range of applicability of different VAT rates is unclear. Finally, a good system should be structured in order to *minimise the loss of welfare and economic efficiency* caused by the impact of taxation. The concept of *neutrality* of tax design plays a central role in terms of efficiency of the tax system, as neutrality

avoids the distortion on economic agents' behaviour caused by the presence of differential tax treatments[9]. In this sense, compared to other forms of indirect taxes levied on final consumption, a uniform VAT rate minimises the distortion in consumption and production's choices (and thus the associated deadweight loss). Overall, given the same redistributive outcome, a VAT system that would embody the properties of neutrality, simplicity, transparency and fairness would lead to a more efficient collection of revenue, avoiding high administrative costs and dis-incentivising non-compliance whilst engaging more productively with taxpayers in terms of policy objectives.

For these reasons, the present work will adopt this set of properties as the benchmark for shaping a proposal of reform for the Italian VAT system. In the current Italian context, an increase of the standard VAT rate has repeatedly been proposed as a budget safeguard clause for a more inclusive process of policy reforms aimed at boosting the economy and the employment rate. However, if a VAT reform is intended as part of a more comprehensive renewal process of the Italian tax system, it is first essential to investigate whether the direction of these changes is in line with the desired scope and whether broadening the VAT base may result in a better alternative for the medium-long term. In fact, as pointed out by Mirrlees at al. (2011) and Gastaldi et al. (2014), the redistributive impact of a tax reform should be assessed on the overall structure of the tax system. The complexity of obtaining joint reliable data on incomes and expenditures for the Italian case has limited the present analysis to a unidimensional approach (see Pisano and Tedeschi, 2014 and Gastaldi et al., 2014). However, it is important to understand how the progressivity of a tax system does not depend on the progressivity of each single tax component but instead refers to the process by which tax revenue is collected and distributed within the system. In this sense, the design of VAT should not necessarily be structured to achieve itself a redistributive outcome but it should be framed to most efficiently support the progressivity of the overall system. In the current tax framework, a reform of the Italian VAT towards a more uniform structure may thus represent the best alternative to reach this objective for the following set of reasons.

First, since VAT only levies on final consumption, it looks preferable to other forms of indirect taxation on transactions, which are indeed sensitive to the volume of exchanges associated to the production of the final good[10]. More specifically, the latter tax would lead to inefficiency in the production process, and it would furthermore distort the consumption choices of durable

[9] In general, neutrality is considered a desirable property of any tax as it reduces the losses in terms of welfare and economic incentives by minimising the distortive effect of taxation. However, the presence of negative externalities represents a positive exception of this rule as, in this case, violations of the neutrality principle may lead to an increase in terms of social welfare.

[10] An interesting discussion on the "desirability" of VAT has been proposed by Keen (2007) for the US scenario, which outlines well the political and economic reasons behind the choice of adopting VAT under different economic frameworks.

goods and services which are traded with a relative higher frequency. A pure tax on transactions would alter the decisions of production through the taxation of producer inputs, whose prices would not reflect anymore the associated marginal costs of production. From a consumer perspective, given the same shifting of the tax on prices (and thus the same budget constraint), the choices to tax each phases of production or to just tax the final outcome is equivalent in terms of welfare. However, on aggregate terms a transaction tax would itself result inefficient, and the economy would have an unnecessary deadweight-loss[11]. By the same token, transaction taxes tend to exert a heavier burden of taxation on durable goods which are usually exchanged more frequently. This method of taxation would inexorably reduce the expected welfare of individuals who have a higher preference for this category of goods and, not less importantly, would violate the principle of double taxation. An additional source of inefficiency arises from the misallocation of asset holding by individuals which arises from the price distortion induced by the tax structure, which ultimately changed the pattern of ownership. Therefore, for all the above reasons and in the absence of further conditions to justify the present indirect tax structure[12], there is no strong supporting economic argument in favour of introducing a tax on transactions instead of on final consumption[13].

As a tax levied on final consumption, VAT is designed to be paid in each part of the production process but to levy only on the final consumer. Then, in practice, the buyer of the good or service is charged effectively by the VAT only if the destination of the purchase is for the purpose of final consumption. In fact, when the good is bought to be employed as an input in a production process the buyer will be able to obtain a refund of the VAT paid. This particular design is aimed to deter tax evasion, by creating a system in which general producers and retailers have an incentive to declare VAT in order to recover the VAT paid for the inputs of production.

The current structure of VAT rates differs significantly between each EU state member. In most cases, theory tends to support the choice of a uniform tax rate structure, the reason being that a differentiated treatment in terms of taxation will distort consumption choices. That is, under different rates of VAT the consumer will buy a different bundle of what he would have bought if

[11] In other words, aggregate welfare would be increased by producing and consuming more quantity without employing additional labour (Diamond and Mirrlees, 1971).
[12] As for the case of financial services.
[13] The idea to introduce a transactions tax for financial services relies on the assumption that it would help to reduce the excessive level of trade that is present in some financial markets. This choice is justified in terms of efficiency given by the premise that excessive speculation in the securities market might induce higher volatility and generate insidious self-generating financial bubbles. Here in lies the economic justification for a Tobin Tax. Moreover, since a VAT for financial services is technically difficult to implement in a market where the final output is not by itself easy to determine, the adoption of a transaction tax seems warranted. Finally, the choice of a tax on transaction is more a consequence of practical requirements rather than a result of economic reasoning, and its widespread use is generally aimed to complement other regulatory aspects of financial markets.

all goods were treated the same (Boeters et al., 2010). Furthermore, uniformity in the tax rate also reduces the administrative and compliance burdens (Cnossen, 2002), and avoids political lobbying related to the choice of the reduced ratio goods. However, from a strictly theoretical point of view the adoption of a uniform rate does not represent the most effective method to raise government revenue. If it is assumed that indirect taxes are directly transferred to the price of the final good, then this increase in prices will reduce the demand of the considered commodity, creating a deadweight loss. Hence, the policy maker will not gain all the expected tax revenue because the demand of goods for consumption has not changed uniformly for all the goods. This cost in terms of welfare, which indirect taxation is prone to carry, tends to be positively related to the impact on the purchasing behaviour of individuals of the tax. From an analytical perspective, this deadweight loss is minimised when higher rates of indirect tax are imposed on goods with a relatively inelastic demand. The idea of an inverse elasticity rule where tax rates should be differentiated across commodities in base of their different price elasticity is the main economic argument in terms of efficiency when favouring the adoption of a differentiate rate system of VAT[14]. However, the main drawback of adopting a differentiated VAT structure under the inverse elasticity rule is that, if inelastic goods are considered to refer mainly to necessities, then it will have a regressive impact.

The concept of tax differentiation can be supported by equity concerns even if, in this case, the economic justification is weaker than the efficiency argument. These assumptions can be of different kinds. First, there is the idea that lower income households tend to spend a larger portion of their income on certain goods which are considered essential for life, and therefore should be taxed at a lower rate. This may be either associated to the fact that some categories of goods and services tend to weight more on the budget of low-income families with respect to the rest of the distribution, or that this pattern of consumption is the reflection of some distributional characteristics of families' expenditure which should be taken into account from an equity perspective. In particular, spending patterns might themselves reveal something about a person needs, whereas nominal incomes may not necessarily reflect such preferences. The last argument seems the only robust justification to differentiation but it lacks conclusive empirical support (Mirrlees et al., 2011).

However, in a more comprehensive tax framework where indirect taxation is only a part of a wider plurality of fiscal measures, the idea to help low-income household by imposing lower indirect taxes on good that they consume relatively more seems inadequate and unnecessary. In fact, when the government is able to exploit the progressivity of income tax and pay welfare

[14] From a theoretical perspective, the inverse elasticity rule requires the assumption of no substitutability or complementarily between commodities. However, when such relationships are introduced, the efficient tax system is described by the *Ramsey rule* (see Diamond and Mirrlees, 1971; Atkinson and Stiglitz, 1976).

benefits accordingly to people's characteristics and needs, then it will be able to achieve the equity objectives more efficiently than with differentiated VAT systems. A limitation to this approach arises from the incapacity of observing important underlying abilities of individuals, which constraints the redistribution that can be achieved via the direct tax system. Considering for instance the case of two individuals with the same level of earnings but with different underlying abilities. One individual is a high-ability person and to earn the same amount has to exert less effort that the other individual, who is a low-ability person and has to work more to gain the same salary. They will both pay the same amount of income tax and the direct system will fail to discriminate between those characteristics in redistribution terms. This implies that the direct tax and benefit system will not be able to achieve a "first best outcome", as it lacks the adequate level of information to structure properly the redistributive mechanism.

A conceptually different argument for differentiated rates is the specific egalitarianism idea developed by James Tobin (1970). The approach is based on the assumption that poorer individuals tend to under consume some essential goods and services, even if they will have the money to afford them. The redistributive goal of indirect taxation should be to create the incentives for these individuals to increase their consumption of those goods at a socially acceptable level. The two main critiques of the egalitarian approach come from the assumptions that, firstly, individuals are generally unable to make the right decision for themselves, and secondly, as argued previously, the fact that spending patterns might reveal information about underlying abilities and needs of consumers.

A different concept of equity is based on the desire to tax similar people in similar ways. Intuitively, the definition of "horizontal equity" relies on the idea that taxpayers with the same capacity to contribute should be eligible of the same tax burden[15]. In the case of indirect forms of taxation, this concept is less straightforward than in the context of direct taxes as redistribution is not only depending on the levels of the tax base but it is also determined by the expression of individual tastes and needs. In this sense, the choice to differentiate taxation across goods will reward or penalise individuals in a rather arbitrary way if this is only based on inconsequential characteristics. That is, in order to analyse the effective redistributive potential of a multi-rate structure, the approach of horizontal inequity needs first to overcome the issues of interpersonal comparability, as it cannot rely on the traditional assumptions regarding the homogeneity of individual preferences (Atkinson and Stiglitz, 1976). Furthermore, the normative significance of discriminating the tax treatment on the basis of unpredictable preferences is not immediately justified as for the case of direct taxation (Decoster et al., 1997).

[15] The definition of horizontal equity may be broaden to the general tax case where "people who are in all relevant senses identical ought to be treated identically" (Atkinson and Stiglitz, 1976, p. 70).

This is why, ultimately, the vertical redistributive nature of the differential structure of rates should also account for an arbitrary judgment on what to consider "horizontally equitable"[16].

All in all, there are consistent economic arguments in support of a uniform rate VAT system when there is a structure of direct taxes and benefits available for policy makers. In several European countries the adoption of a uniform VAT structure would imply a broadening of the current base and the partial removal of reduction rates and exemptions (Lejeune, 2011). The logic behind this point is to target the objective with the adequate instrument: VAT is a relatively efficient and well-designed indirect tax which, under a uniform rate structure, can optimally increase the revenue without distorting consumption choices. However, mitigating the regressive nature of VAT[17] through the adoption of differentiated rates is likely to be costly and inefficient. In developed countries with a well-structured tax system as in the European Union, direct taxation and the benefit system represent the best way to target distributional objectives (Mirrlees et al., 2011). In this scenario, the progressivity of the income tax is employed to achieve redistribution, and uniformity in indirect taxes allows to raise revenue and to avoid distortion in consumption choices. More importantly, unless consumption patterns can reveal information on hidden abilities or needs of individuals that their overall spending and income patterns cannot, differential indirect taxes will never be able to achieve the distributional effects provided by a progressive direct taxation.

Finally, it is important to highlight that even if broadening the VAT base can be a powerful instrument to increase economic efficiency and consumers' welfare, it does not itself provide a solution to the trade-off between revenue, equity and work incentives. Such objectives should be pursued at a more general context, and the way tax design can address these goals is to provide principles of "best-practice" to follow when reforming the structure of the tax system in order to most effectively comply with policy needs and budget constraints.

1.3. Analysing the distributional impact of VAT

The scope of any analysis concerned on the distributional impact of a tax is to find ways to assess who really bears the burden of taxation (Mirrlees et al., 2011). The concept of measuring incidence is strictly related to the definition of progressivity in terms of the ability of taxpayers to contribute to the social State. That is why incidence or, more specifically, the measure of the extent of the contribution required by the tax with respect to the tax base, has usually been used as a way to measure the impact of taxation. As a proportion of the tax base, any measure of incidence and its related redistributive outcome tend to be sensitive to the tax base chosen.

[16] Such approach will be explored in the empirical analysis to compare the desirability of a uniform (and neutral) VAT structure against the apparently more redistributive current multi-rate system.
[17] With respect of annual income.

Such an issue is particularly relevant for the case of VAT (and in general for indirect taxes) as income and expenditure may either been employed as the tax base, resulting in different outcomes regarding the magnitude of the regressivity of the tax.

In addition, it is important to keep in mind that the legal incidence of a tax does not generally equal the economic incidence or, in other words, who is effectively bearing the burden of taxation (Mirrlees et al, 2011). From an empirical perspective, determining the economic incidence is always difficult to assess. However, it is important to highlight how these types of analysis have recently focused more on measures of incidence over the life-cycle of the taxpayer, especially for the case of policy-oriented studies. For this reason, the present work adopts households' expenditure as the main base indicator for taxpayers' ranking. In general, the distributional impact of indirect taxation is measured with respect to family disposable income, as it enables researchers to directly compare the impact of different fiscal measures and to carry out comprehensive analysis of tax reform. However, the comparison may be misleading for the case of VAT. VAT incidence on income is *per se* regressive, as the consumption share tends to decrease with higher incomes due to the increasing propensity of saving associated (Decoster et al., 2010; Mirrlees et al., 2011). Furthermore, higher income families tend to consume more some services that are generally not taxed via VAT, as foreigner expenditure when travelling abroad or education received in other countries[18]. Overall, the results obtained are not independent from the way the (distributional) impact of VAT is measured. This highlights how central the role of the design of tax reforms is in these types of analysis (Gastaldi et al., 2014).

Ideally the choice of the base measure should be able to reflect who really bears the burden of the tax. For the way VAT is designed, it is likely to assume that an increase of VAT rates generally translates on prices and thus results in a welfare loss associated to a diminished level or value of consumption[19]. Furthermore, annual income is generally adopted as the measure of living-standards on which most of the taxes are computed and paid (Shome, 2011). Therefore, income may seem the most appropriate measure in order to take into account the overall impact of VAT on taxpayers' decisions.

[18] Shome (2011) actually argues that this would make VAT result even more regressive, as that does not account for VAT-free services like private health more accessible to higher-income groups.

[19] This argument relies on the implicit assumption that, in a competitive scenario with neutral monetary policy, an increase of VAT will first translate in an increase of production costs, which will ultimately result in an increase of the final price of goods. In addition, stating that the burden on VAT rests on consumers implicitly assumes an economic scenario where the velocity of money is sufficiently fluid to allow firms to adjust nominal prices in response to VAT rate changes. If that is the case, an increase of the VAT rate would be proportionally reflected in consumers' expenditure (U.S. Department of the Treasury, 1984).

From a theoretical point of view, it has been pointed out (Decoster et al., 2010; Mirrlees at al., 2011; Arsic and Altiparmakov, 2013) how patterns of consumption usually represent a close proxy of the expenditure profiles of consumers. Even in the case of durable goods, consumption can provide a reliable estimate of the flow of benefits related to the usage of these goods over time. From this premise, Friedman (1957) asserts how patterns of current expenditure tend to be less sensitive to temporary shocks in current income than to permanent ones, as individuals smooth their consumption profile over their life-cycle optimizing their behaviour. For this reason, consumption seems to provide a more accurate empirical measure of life-time resources than income. Furthermore, due to the stable nature of consumption over the business cycle, expenditure proves to be an optimal base for measuring an increase of the incidence of indirect taxes.

All in all, given the existing data sources available, the question is whether annual income may represent a proper proxy for the wellbeing of families given its high level of volatility and, therefore, if consumption (under the form of final expenditures) may instead represent a valid alternative when measuring medium-long term impact of indirect taxes. Ideally the best alternative would be the adoption of a joint measure, which would take into account a broader concept of disposable income by including some expenditure measures. Such an indicator is currently not available for the case of Italy, as micro-data regarding expenditure and family incomes are collected through two separate surveys which follow very different methodologies. Hence, this work argues how expenditure may be a better proxy of lifetime resources than annual income when assessing the impact of a VAT reform (Crossley et al., 2009; Mirrlees et al., 2011). On the other hand, the permanent income hypothesis (Friedman, 1957) relies on the assumption that families are able to access the credit market, and thus to smooth their consumption patterns through borrowing or lending money (i.e. without credit rationing) (Tax Research UK, 2010; Shome, 2011). In this sense, the present analysis makes use of some indicators related to the expenditure habits of families recorded within the Italian Household Expenditure Survey (HES), in order to identify whether or not a household declared to have accessed the credit market to purchase goods or services. Another important issue to address when analysing the impact of a tax relates to the fact that many forms of taxation (or some of their components) are levied at a household level. In the specific case of VAT, expenditures are generally recorded at a family level to account for economies of scales and this requires some analytical ways[20] to correct these figures to make them comparable across taxpayers.

Finally, note how within the theoretical framework of models of consumer demand, approaches based on the elasticity criterion tend to design individual demand to assess the effect of VAT

[20] As for instance the use of equivalence scales.

reforms on the levels of expenditure. One of the main advantages of these models is their potential in quantifying the effect of a VAT reform while, conversely, the approach followed by this work looks at direction of reforms. However, the exclusion of relevant substitution effects and the requirement of very strict assumptions on consumer preferences make these models unable to account for the presence of heterogeneous tastes and patterns of consumption. Another possible method of analysis would be the use of general equilibrium models to estimate the effect of changes in the VAT rate(s) on prices and quantities demanded within different economic sectors (Copenhagen Economics, 2007; Boeters et al., 2010; Bye et al., 2011). However, an important limit of this category of models is that they require a high-level aggregation of expenditure categories in order to produce robust estimates, whilst not being free from the requirement of further restrictions on consumers' behaviour. Some authors (Nichele and Robin, 1995; Patrizii and Rossi, 1993[21]) have made use of Almost Ideal demand systems (AI), which generally enables more flexibility when evaluating jointly prices and income effects, but still there is a consistent loss of information when using these methods, which makes the use of these models not particularly adequate to capture the fragmentation of the existing Italian VAT structure.

Under these premises, the analysis of reform proposed in this work makes use of microsimulation techniques, trying to go beyond traditional methods of measuring incidence through an approach of horizontal inequity. The driving aim behind this choice is to provide an alternative insight of the concept of fairness of the taxation process associated to the adoption of differential VAT rates whilst accounting for the presence of heterogeneous preferences of consumption. Furthermore, the impact of the proposals of reform presented is part of a more comprehensive analysis of the opportunity of migrating towards a more uniform VAT structure, with the objective to stimulate some further reflection on the actual redistributive power of the current Italian system given the existing set of fiscal alternatives and the directions provided by the European Union.

1.4. The economic rationale behind the current VAT rates

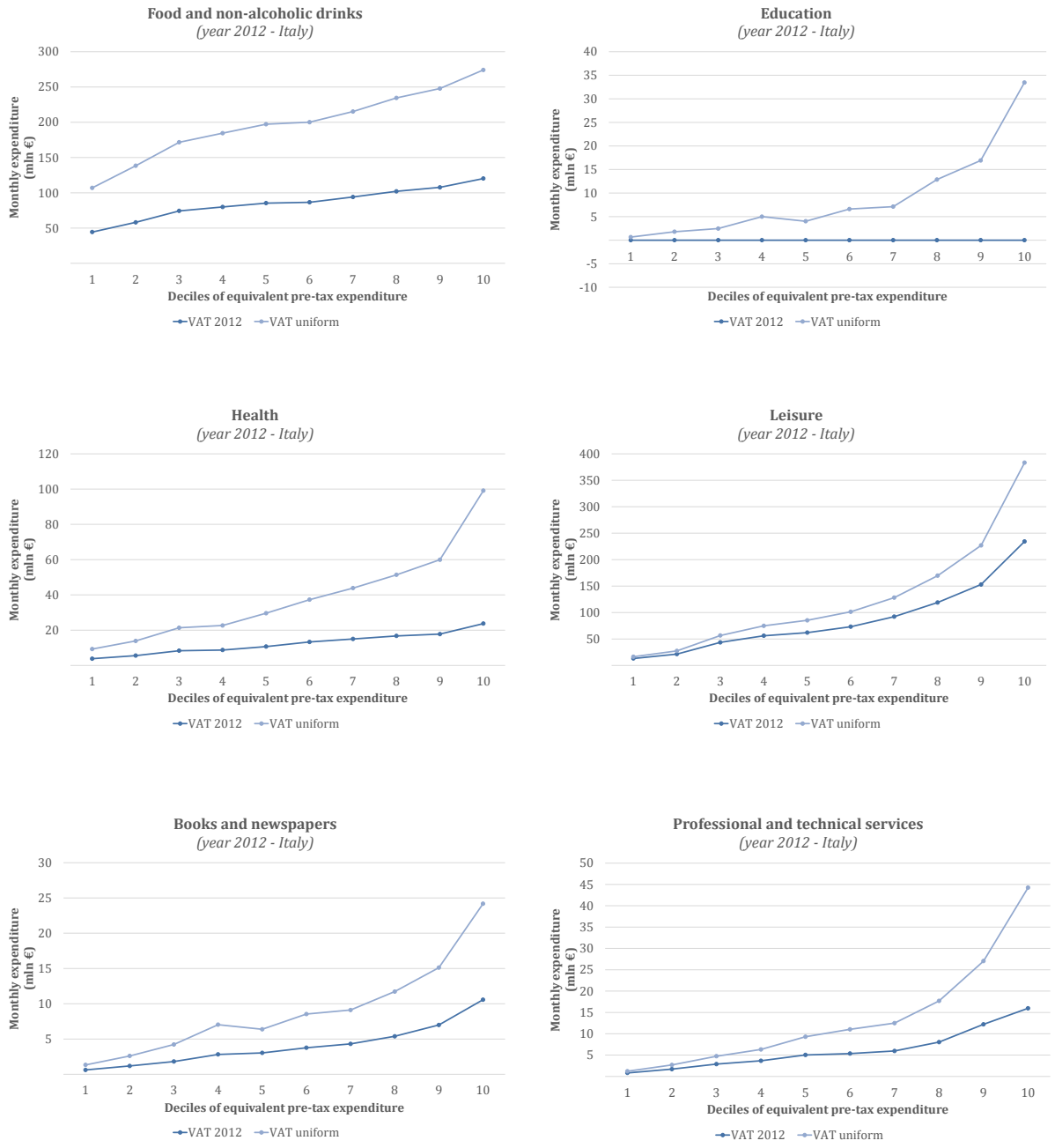
The existing multi-rate VAT structure of many European Countries (including Italy) was originally intended to reflect a mix of economic principles and legislative provisions (EU Directive 2006/112/EC). However, in most cases, the economic argument behind the adoption

[21] More specifically, this work adopts a mixed approach between the representative agent model and the aggregation of preference method: an almost ideal demand system. The assumptions underlying this model are of a partial equilibrium model based at a household level (family seen as the centre of consumption decisions), inter-temporal separability (household expenditure is pre-determined and does not change with price), constant production costs (full translation of the tax on final prices uniformly across sectors), and finally that the variation of indirect taxes does not affect the revenue from other taxes

of reduced VAT rates is rather weak. For this reason, this section provides a general overview of the possible economic driving principles behind the design of these systems, with a comparison of the available fiscal alternatives that could substitute the present reduced rates.

Amongst the whole set of commodities and services, the case of *necessities goods* (e.g. *food*) has always be regarded as eligible of a differential VAT treatment under strong equity concerns. As previously highlighted, the adoption of reduced rates is based on the premise that this type of goods (by definition) tends to be inelastic in terms of price, whilst capturing a higher share of the budget of low-income households. That is, as necessity goods tend to represent a substantial larger portion of the expenditure of low-income families, this ultimately results in a higher VAT burden for low-income taxpayers when a non-reduced rate is applied. However, whilst in relative terms necessity goods tend to impact more on the budget of low-income households, in absolute terms low-income families tend to consume a very marginal share of the whole expenditure for food. In this sense, reduced rates always result in an erosion of the tax base as all final consumers benefit from the discount of the rate, independently on their levels of income and expenditure (U.S. Department of the Treasury, 1984). In some circumstances, as for the case of food, it is worth questioning whether this may lead to a very large and unnecessary erosion of the VAT base, as the sacrifice of revenue to support this relatively small share of expenditure may exceed the resources that would be required to support these low-income groups through alternative means as indexed transfers. Figure 1.1. provides a graphical representation of the VAT base erosion by comparing the revenue obtained for the existing differentiated Italian VAT structure in 2012 and the associated hypothetical uniform scenario for the major categories of expenditure which fall within the reduced or exempted regime. It can be immediately noted how the gap in the VAT that would be potentially paid under a uniform VAT rate (given the same shares of expenditure) and the current VAT distribution increases by decile of equivalent expenditure. This clearly shows how families with higher levels of overall expenditure benefit from a larger fiscal benefit, which can result in significant losses of revenue for consistent expenditure categories as food and non-alcoholic drinks, health and leisure.

Figure 1.1. Erosion of VAT base by category of expenditure (2012, Italy)



Source: HES data (2012), author's own calculations.

Not less importantly, a reduced rate favours consumers with a stronger preference for that specific good or service. This type of distortion in consumption choices is particularly relevant for the case of food as different rates often apply to items in the same broad food category (e.g. biscuits and flours). This also adds further complexity (and cost) to the system as in some cases it is not straightforward to identify which rate applies to each category. As in the case of processed foods as home-made meals vs restaurant, where the distinction between these two categories is sometimes very unclear.

The effectiveness of reduced VAT rates on food depends also on the characteristics of the original income distribution (Copenhagen Economics, 2007). In countries with lower income inequality, consumption patterns tend to be distributed more homogeneously. This is especially true for the case of food expenditure (Copenhagen Economics, 2007). In these circumstances, the distributional impact of reduced VAT rates on food tend to be marginal, as the gap in terms of expenditure between lower and higher tails of the distribution is particularly narrow. Food subsidies may thus represent a better alternative from a distributional prospective. On the other side, in countries with a larger dispersion of consumption patterns - as for the case of Italy - it should be taken into account that a uniform VAT rate scenario would impact more regressively on low-income families with respect to countries with lower levels of inequality.

Finally, a possible way to analyse the impact of reduced VAT regimes on low-income households is to explore the inequality of the distribution of final expenditures. More specifically, some prior analysis for the Italian VAT case have been investigating the distributional characteristics of the goods and services subject to VAT (Liberati, 2000; Gastaldi et al., 2014) with the aim to assess directions of distributionally-improving scenarios of VAT reform. Ultimately, Gastaldi et al. (2014) find how in the case of Italy the variety of rates does not generate a better redistributive outcome than a more uniform two-rate scenario, casting some doubts on the benefit of using a plurality of VAT rates.

Another category which generally falls under the same rubric of necessities goods refers to *health services and medicines.* In general reduced rates or exemptions apply to health expenditure and consumption of drugs and medicines. As the items in these categories are generally easier to identify, it may be possible to expand the lower rate to the whole category with less distortive consequences that for the case of food.

On the contrary, *housing, maintenance services and energy* are usually affected by a variety of VAT rates which blur the ultimate aim of the policy maker. In general, the underlying objective is to reduce the burden on low-income groups by applying reduced rates on social housing expenditure. However, the inability of VAT to encompass all the types of expenditure related to

housing is evidence of the difficulty in targeting the correct tax base as, for instance, VAT is not levied on imputed rent or owner-occupied housing. This implies that the erosion of the base is very fragmented and it is very difficult to identify who really benefits from the imposition of reduced rates. In this case, there is little doubt that this problem would be better targeted by indexed transfers or subsidies for eligible low-income families, eventually linked to social house benefit programs. Alongside, reduced rates on energy[22], water and sanitation services follow the same rationale as housing expenditure. In other words, these services may be better targeted through forms of monetary subsidies and this would avoid any conflict with other more specific forms of energy taxation (e.g. energy tax).

In the context of housing expenditure, it is also important to distinguish between housing support and reduced VAT for house maintenance expenditure. On further observation, reduced VAT rates on house reparation services aims to reduce the incentive in do-it-yourself (DIY) and underground activities, with the ultimate goal to increase work productivity as consumers will find less convenient to allocate part of their leisure time to these activities (Copenhagen Economics, 2007). However, in the Italian case the existing distinctions within this category (e.g. ordinary and non-ordinary house maintenance, typology of service offered, etc.) create a fragmentation of the intended benefit, making impossible to identify which is the ultimate target of the application of reduced rates. The same argument applies for the case of *professional services* which can present different VAT rates depending on the nature and scope of the service provided. It seems hard to identify under the current Italian structure an incentive for reducing DIY services, as the application of a reduced VAT rate regime mostly depends on a set of specific circumstances which goes behind the sphere of intervention of the legislator.

The adoption of reduced rates for *touristic services* falls on the heels of supporting the demand within the touristic sector and to facilitate the competition with other countries by applying reduced VAT rates. Implicitly the ultimate aim is to boost employment through an increase in the demand of key economic sectors (as touristic services for the case of Italy) resulting from a lower VAT rate. Copenhagen Economics (2007) show how gains in welfare may be significant in European countries with high tax wedges and a rigid labour market but, in general, it is unlikely that differences in VAT rates would significantly have an impact on travelling decisions in the longer term. Furthermore, in the European context cross-borders issues tend to create a distortive concurrence in countries with regions that are close to each other (i.e. Cross-border trade problem).

[22]Note the European VAT Directive allows reduced rates on the energetic sources that are bought directly by the consumer (e.g. network delivered energy, as heating). Standard rates should instead apply to the rest (e.g. energy sources used for transport).

So far, violations of VAT neutrality have been considered an undesired consequence of differential rates for their distortive effect on the behaviour of economic agents. However, there are some exceptions where altering consumer decisions may increase aggregate social welfare. The argument entails the case for *merit goods* and *negative externalities*. The latter mainly concerns the tax treatment of excise duties and is therefore not extensively treated here[23]. However, it is worth to question whether the current excises structure in Italy (and many European Countries) is somehow distorted from its original aims as it still accounts for old negative spillovers whose economic rationale is far from clear (e.g. excises for financing Italian previous wars).

On the other hand, the application of reduced rates to goods that are considered worth of a differential tax treatment (i.e. merit goods) is usually associated to an egalitarian perspective, where governments should not only target redistributive goals but should also alter the consumption patterns of taxpayers by encouraging the consumption of specific goods which are considered beneficial for the individual himself. That is generally the rationale behind the existence of reduced rates for some categories of books and newspapers, cultural shows and entertainments, as well as for education. In general, such treatment reflects an arbitrary judgment on which activities should be stimulated that ultimately discriminates amongst personal differences in tastes. For instance, in the Italian case only some "cultural" services are considered eligible of reduced rates. Often, within the same category (e.g. sport), differential treatments apply given the scope of the activity (e.g. annual subscription vs single entry). The same applies for the case of books, where only specific categories are eligible of reduced treatment (e.g. school books and daily newspapers). Not only, given the rapid growth of online technologies as e-book, such distinction results hard to identify while it is still unclear why in this case the government should try to discriminate on the nature of the service itself. Finally, it seems difficult to determine whether a reduced VAT rate on merit goods actually induces low-income families to consume more of these commodities, or if either it mostly subsidies higher-income groups which generally allocate a very high share of their expenditure to cultural and entertainment services (Copenhagen Economics, 2007; Mirrlees et al., 2011).

Another exception to the neutrality principle is the case of goods and services that are *complementary to leisure and work*. In the first case, goods and services like restaurants and entertainments should be treated more heavily in order to discourage high-abilities individuals to reduce their work in order to avoid paying more taxes. This is an implicit consequence of every progressive tax system. Conversely, activities which are complementary to work as

[23] Briefly, the aim of excise duties is to "rectify" the private price of a good or service towards its social price. For this reason, excises apply to specific categories of commodities only whilst VAT is instead levied on all consumption choices.

childcare or public transportation should be eligible of a reduced VAT regime with the aim to facilitate taxpayers in allocating their work time. In general, any tax presents an income and substitution effect on the individual choice to allocate work and leisure (Barrell and Weale, 2009). In the case of an increase of the uniform VAT rate this would imply that consumers will be able to purchase less goods as their purchasing power would be reduced (i.e. income effect), and at the same time one hour of work will be worth less in terms of the amount of consumption that it can buy (i.e. substitution effect). In this sense, an increase in the VAT rate endures the same disincentive to work as an income tax, so any decision of shifting the balance towards indirect taxation should bear that in mind.

Finally, differential VAT rate systems are also characterised by the presence of exempted or zero-rated goods and services. The difference between these two regimes is that VAT registered traders can claim the VAT charged during the production process of a zero-rate good, so any added value generated by the use of any input is effectively not charged of VAT. From the opposite perspective, exempted goods are free of VAT only in the final stage when they are sold, whilst VAT is still charged on the added value created during the production process. These two mechanisms are conceptually different as the final price of a zero-rate good will be free of VAT while the final price of an exempted good will incorporate the VAT charged over the production process, even if below the standard VAT rate. However, this mechanism is not always convenient for consumers when exempted goods are used as input of production of non-exempted goods which will ultimately bear in their price the irrecoverable VAT associated to the exemption mechanism.

As already highlighted by several authors, for instance Cnossen (2002), Copenhagen Economics (2007), Crawford et al. (2010) and Mirrlees et al. (2011), the exemption mechanism is against the aim behind the design of VAT, as it distorts production decisions by breaking the neutrality of VAT in the choice of the inputs of production. For instance, exemptions create an incentive for producers to self-supply the inputs of productions (Mirrlees at al., 2011) and this creates distortions when those firms are competing with non-exempted producers.

In general, exemptions should mainly encompass those special cases where the imposition of VAT goes behind the actual remit of the tax. That is the case of public services where otherwise VAT would just be transferred through government departments. However, some specific services of public interest are also competing with the private sector and the mechanism of exemptions creates unnecessary distortions in the market of these goods and services.

Recapitulating, the arguments outlined previously lead to the following set of final remarks:

- The imposition of reduced rates causes a loss of efficiency in the VAT system (i.e. higher administrative and compliance costs), unnecessary erosion of revenue, distortion in consumption choices and discrimination on the base of the consumption preferences.

- Alternatively the burden of VAT on low-income groups can be minimised through other means (e.g. indexed transfer payments, subsidies) which are generally designed to target the specific group of interest.

- Undoubtedly, low-income families spend a consistent share of their budget towards necessity goods, housing and health. If these categories of goods and services were taxed at a standard rate, low-income families would thus bear a higher VAT burden than other income groups who employ a lower share of their expenditure to purchase these goods. However, the share of expenditure attributable to low-income groups is relatively marginal compared to the rest. Then, the application of reduced rates to these categories goods and services ultimately results to benefit (in absolute terms) income groups that were not originally intended to receive a fiscal relief.

- In the Italian case, the presence of differential VAT rates within the same category of goods and services (e.g. food, newspapers and book, cultural activities, education related services) fosters non-compliance and increases administration costs. At the same time, such an extreme micro-rate structure does not reflect any economic rationale in terms of necessity or merit goods as the differential benefit within categories can hardly be assessed and goes behind the scope of VAT. The same applies for the case of house maintenance expenditure and professional services, where the current system is so fragmented that fails to target its original aim to dis-incentive DYI work and provides benefit under specific and personal circumstances which are outside the remit of VAT.

- The effectiveness behind the application of reduced VAT rates for touristic services is still unclear. Reduced rates may help boost demand and employment in the touristic sector but it is unlikely that in the long term a tax reform will consistently affect the growth of this market by itself. It is worth questioning whether these resources should instead be allocated to support more comprehensive policy plans for the economy and the sector. Currently, Italy applies to internal touristic services an intermediate VAT rate of 10 per cent and this represents one of the principal VAT categories which exclusively fall under the intermediate rate regime.

- There are some cases where violations of VAT neutrality may be considered socially acceptable. That is the case of merit goods and negative externalities where altering the original behaviour of economic agents increases the aggregate social welfare. The case of negative spillovers (i.e. externalities) is usually addressed by excises duty with the intent to specifically reduce the gap between the private and the social price of a good, going beyond the scope of VAT. On the contrary, reduced VAT rates on education and cultural goods and services are generally intended as a way to encourage the consumption of particular commodities whose demand is considered "socially" too low (i.e. merit goods). The current fragmentation of reduced and standard rates within this category makes the Italian structure particularly inefficient, as the application of a reduced regime seems to be based on an arbitrary judgment regarding the scope behind the use of that service or good. More interestingly, it is legitimate to wonder whether the decision of applying reduced rates to specific categories is more the outcome of a political lobbying process rather than the desire of stimulating a broader use of cultural goods (Tyson, 2014). As for the professional services rates, this appears to be a more general problem of the current Italian VAT rate structure. However, even in the absence of such concern, it seems meaningful to wonder whether this egalitarian approach oriented on altering consumers decisions would actually be rather inefficient in developed country like Italy, and would instead provide an unnecessary benefit to high-income families who usually are the larger consumers of these typologies of goods and services.

- Activities which are complementary to leisure and work may be subject to different VAT regimes. The aim is to disincentive high-ability individuals in allocating more time to leisure and thus avoiding falling in the higher tax scales of the progressive structure of the tax system. In the Italian case goods and services complementary to leisure are often considered cultural activities so reduced VAT rates are generally applied while, under this reasoning, they should be taxed more heavily to disincentive leisure activities. On the other side, child care and public transportation should be eligible of a reduced regime as they are complementary activities to work. This is partially the case for Italy, as not all the services and goods that could fall in these two categories are currently taxed at reduced rates. For instance, reduced rates only apply to childcare when this activity is carried out as a long provision service (nursery), whilst the standard rate applies to any other babysitting activity.

- The exemptions mechanism generates incentives for non-compliance and bear higher administration costs. Not less importantly, it also distorts competition between firms, public sector and across European countries. Note that, under the current EU regulatory framework, exemptions must be applied to financial, health and education services, with the latter being defined by each state member. The Italian system does rely consistently on the exemption mechanisms, bringing the current VAT system to an actual four-rate structure.

- In any case, a zero-rate system will always look preferable to the exemption mechanism as the former does not distort the neutrality of the design of VAT. More specifically, a zero-rate good implies that the added value generated through the inputs employed in the production process will not be charged of VAT if the intermediate good is destined to produce a zero-rate product. On the contrary, the exemption mechanism only exempts from the payment of VAT the final product whilst charging VAT on all the added value generated during the production process.

- Overall, it is important to keep in mind how the distributional effectiveness of a multi-rate VAT structure is related to the underlying consumption patterns and income distribution. Hence, subsidies tend to be more effective than reduced VAT rates in countries with lower income inequality.

- However, most economic arguments in terms of equity associated to reduced VAT rates are valid for other means (e.g. subsidies, indexed transfer payments, in-kind transfers), while the latter ones do not suffer of some limitations associated to reduced VAT rates as undesired benefits to the higher income groups, distortion in consumption choices, and confusion in the attribution of the correct rate.

In this sense, the proposal of VAT reform presented in the work has been shaped on the basis of these considerations. More specifically, the aim behind the design of the reform scenarios is two-fold. First, there is the attempt to preserve the original desirable properties of VAT design with the goal to identify which structure of VAT would better serve the current objectives of the legislator. In this sense, the analysis of this chapter has explored the possible optimal directions of reform given the theoretical framework on optimal tax design, the equity concerns and the Italian legislative and economic framework. Second, the reform proposal aims to critically account for the inconsistencies associated to the existing Italian VAT rates, trying to outline viable alternatives to pursue the redistributive goals embodied in the current structure. The result is a proposed two-rate VAT structure with reduced rates and exemptions on specific identifiable categories of commodities, where the fragmentation of different rates is avoided

and the adoption of a reduced rate is used in the cases where it still represents a suitable alternative to the use of in-kind transfers or equivalent policies. Following the aforementioned discussion, the next chapter will outline the methodology adopted to assess the redistributive impact of these scenarios of reform, and then an analysis of the empirical scenarios of reform will follow.

2. Horizontal Inequity of VAT

In the current debate of shifting the weight of taxation towards indirect taxes, a reform of the VAT system plays a central role in achieving revenue targets. Alongside, it would be desirable to preserve the redistributive balance of the system which, under the current structure, relates to the existence of differential VAT rates. For this purpose, it is first necessary to identify amongst the existing methodologies the ones that would best support the analysis of the different VAT structures under examination.

As each of these methods starts from a different theoretical perspective and incorporates a different set of assumptions, the choice mainly depends on the scope and on the nature behind the design of reform proposals and it strictly relates to the economic principles under investigation. In this sense, the present study is based on the hypothesis that the effectiveness of a differentiated VAT structure in achieving its distributional target may be reduced by the presence of heterogeneous and unpredictable individual tastes and needs. In order to test this assumption, the analysis starts from the empirical approach formalised by Aronson et al. (1994) and Lambert and Ramos (1995, 1997a), who measure the redistributive effect of an income tax in the transition from pre- to post-tax income distribution by decomposing the overall redistributive effect into a vertical and horizontal component of inequity. Following the income tax case, Decoster et al. (1997), Creedy (1999), and Kaplanoglou and Newbery (2008) apply this methodology to the case of indirect taxes, which by extension will be employed in the present study. Drawing from past contributions, this chapter revises such decomposition in order to investigate the redistributive structure of the Italian VAT system whilst providing guidance on future directions of reform and a critical analysis of the overall concept of tax progressivity in the case of VAT.

The vertical redistributive effect of a tax measures the impact of the “effective tax schedule” among taxpayers. However, individuals display different preferences and needs of consumption so that the effective tax schedule will diverge from its true values, as the presence of arbitrary individual characteristics is not accountable in the design of indirect taxes. In this sense, horizontal inequity refers to the different tax treatment among “equal” taxpayers who are supposed to bear the same tax burden. In the framework of direct taxation, violations of the principle of horizontal equity are generally considered an undesired property of the tax system, as individuals with the same ability to pay are discriminated on the basis of characteristics not related to the original aim of the tax. This may be due to the presence of hidden individual

abilities and characteristics which are not captured by the tax base measure (e.g. taxable income) and by the tax design.

Such an argument is less straightforward for the case of indirect taxes, as individuals display different preferences and tastes and the extent by which they should be discriminated regarding this set of characteristics is unclear from a tax design perspective[24]. It can be argued (Decoster et al., 1997) that such concern should not represent a driving reason for policy makers when designing indirect taxes, as it involves the expression of arbitrary preferences. That is not always the case as consumption choices may derive from special needs and specific consumption habits that may be associated to specific social groups. More importantly, as the design of some indirect taxes – as in the case of multi-rate VAT systems– reflects a distributional aim of the legislator, it seems legitimate to wonder whether this intended redistributive goal is effectively targeted by the current system, or if instead violations of the principle of horizontal equity lead to significant losses of distributional impact and revenue efficiency.

In the specific case of VAT, a uniform rate scenario[25] - horizontally neutral and vertically proportional[26] - represents the best benchmark to investigate how individual characteristics may result in different tax burdens once differential rates are introduced in the system (Decoster et al., 1997). The decomposition approach proposed allows the analysis to target this set of concerns and to investigate empirically whether the Italian VAT system would be better off, from a distributional perspective, with a more uniform rate structure. Furthermore, in the framework of indirect taxation, this method provides some reasoning on whether an increase of horizontal inequality may be considered acceptable if accompanied by a significant vertical redistribution. Finally, measuring horizontal inequality also provides a synthetic measure of the impact of (multi) VAT rates given consumption preferences of individuals (e.g. personal tastes, special needs).

[24] Note that some of these characteristics may be considered worth of a different tax treatment from the legislator. This may be the case for particular categories of vulnerable groups, as people with disabilities (Decoster et al., 1997). These cases may be regarded differently from the differentiation of individuals on the basis of personal preferences or tastes (consumption taxes), or hidden abilities within individuals (income tax). The differentiations between "needs" associated to particular characteristics of more vulnerable taxpayers, and purely individual "tastes" and "preferences" has been taken into account in the analysis.

[25] From a theoretical perspective, uniform taxation does not necessarily represent the optimal condition to achieve horizontal equity (Atkinson and Stiglitz, 1976), as ultimately the tax burden will depend on the price elasticity of commodities. Following the analysis of the first chapter, theoretically the concept of horizontal equity contrasts with the maximisation of the welfare function as it introduces a further element of distributional concern (Atkinson and Stiglitz, 1980).

[26] In the sense that, in the absence of rate fragmentation, the vertical redistributive effect of VAT would only depend on the levels of expenditure and there would be no different fiscal treatment associated to the diversity in tastes and needs.

2.1. Decomposing the overall redistributive effect of taxation

2.1.1. The background

In the framework of direct taxes, Aronson et al. (1994) show that it is possible to decompose the overall redistributive effect of a tax in (1) a vertical effect associated to the effective tax schedule, (2) a horizontal effect associated to the (unequal) treatment of equal taxpayers which should be subject to the same tax schedule (i.e. horizontal inequity), and (3) a re-ranking effect arising from the different treatment of unequal taxpayers.

In general, a progressive tax should ideally rely more on taxpayers with higher capabilities to pay while at the same time being neutral among individuals with the same wellbeing. However, the progressivity of any income tax is generally designed through a structure of bands of income, which ultimately derives from the practical issues related to the adoption of such an imperfect measure of wellbeing as taxable annual income. More importantly, individuals with different abilities may be treated in the same way when these diversities are not captured in the design of the income tax. In this sense, violations of the concept of horizontal equity affect the *fairness* of the redistributive process generated by a tax (Plotnick, 1981).

The approach proposed by Aronson et al. (1994) aims to overcome the issue of measuring horizontal inequity following the previous contributions of Feldestein (1976), Kakwani (1977) and Plotnick (1981). In their work, they interpret the horizontal and vertical effects of income taxation in terms of local inequality and they adopt the Gini index as a measure of the inequality associated to the pre- and post-tax income scenarios.

The work of Aronson et al. (1994) has been subsequently repurposed by Lambert and Ramos (1995, 1997a) who instead capture horizontal inequality through the Mean Logarithmic Deviation (MLD) of incomes. This particular measure allows them to unambiguously identify the horizontal effect avoiding any distortion associated to re-ranking of units. Their method measures vertical and horizontal inequity through two synthetic indicators so that horizontal inequity is now interpreted as the loss of vertical performance in the tax system. As in Aronson et al. (1994), pre-tax income levels are used as a measure to identify the ability to pay of tax payers, so that individuals with the same pre-tax income are considered “equals”. Horizontal inequity is then measured as post-tax inequality among pre-tax “equals”.

The decomposition approach of horizontal inequity developed for the income tax case by Aronson et al. (1994) and Lambert and Ramos (1997a) has been applied to the indirect tax scenario by Decoster et al. (1997) and Creedy (1999). A subsequent work from Kaplanoglou and Newbery (2008) applies this methodology to the indirect tax structure of Greece showing the

distributional benefit of a transition to a more uniform two-rate VAT structure based on the UK model. These authors measure horizontal inequality in terms of the tax paid among "equal" groups of taxpayers who present the same pre-tax expenditure values.

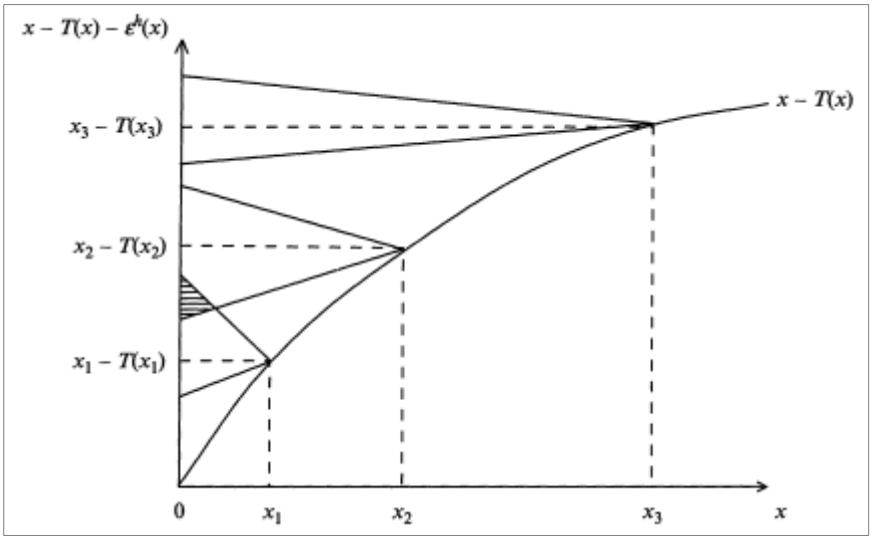
2.1.2. The methodology

As the population of tax payers is *per se* heterogeneous, taxpayers do not bear the true tax liability. Given a generic tax on final consumption *t*, this can be expressed as:

$$T^h = T(x) + \varepsilon^h(x) \qquad [1]$$

Where T^h is the actual tax liability of household h, $T(x)$ is the true liability given expenditure x with $T(x)/x$ increasing and $T(x)' < 1$, assuming that t is a progressive tax. $\varepsilon^h(x)$ represents the disturbance, i.e. the random deviation from the true tax liability due to heterogeneous preferences of households. Assuming that $T(x)$ would be a perfectly equitable tax in absence of heterogeneity, the error is assumed to be random with mean zero. This means that, given the existence of different tax treatments, overall the system is able to compensate for these differences. Under this assumption, the unequal treatment of equals is associated to the underlying and unpredictable distribution of preferences represented by the error term. Vertical, horizontal and re-ranking effects can then be singularly defined. This is showed in Figure 2.1.

Figure 2.1. Horizontal inequity given individuals tax liability



Source: Aronson et al. (1994)

Given households with pre-tax levels of expenditure equal to x_1, x_2 and x_3, their post-tax expenditure will be around the average values of x_1-T(x_1), x_2-T(x_2) and x_3-T(x_3). On aggregate, the distance around these means would be zero under the

assumption of a random disturbance. It is interesting to note as the existence of "fans" shows very clearly the nature of horizontal inequity and re-ranking effect. More specifically, the area delimited by each fan shows the horizontal effect while the overlapping between fans highlights the presence of re-ranking. Finally the vertical redistributive effect arises from the differential structure of the tax, which in this case is progressive.

From this simple example it is straightforward to note how crucial is to measure the re-ranking effect in order to accurately identify the component of horizontal inequity, as these two effects relate to two different groups of tax payers and, more importantly, represent different processes. Horizontal inequity refers to the fairness of treatment for tax payers that should be liable of the same tax burden, while re-ranking occurs when the redistribution process alters the rankings of taxpayers. Hence, these two processes bear different implications and the interpretation of their impact may change depending on the tax framework[27]. Finally, note that both processes rely on the assumption that the pre-tax distribution can be considered fair and thus represent an adequate benchmark for the analysis[28]. This may be the case if the current empirical pre-tax distribution reflects the rank desired by the policy maker (Lerman and Yitzhaki, 1994; Lambert and Ramos, 1995).

Let's assume that taxpayers can reliably be partitioned in *k*-groups of "exact equals" on the basis of their pre-tax expenditure, where pre-tax expenditure acts as a proxy measure[29] of their ability to pay associated to *t*. The overall redistributive effect (*RE*) can then be measured by comparing the Gini indexes measured on the *before*- and *after*-tax expenditure distribution (respectively G^b and G^a):

$$RE_G = G^b - G^a \qquad [2]$$

Where the Gini index based on post-tax expenditure G^a can be expressed as the sum of

- the between-group Gini coefficient obtained by replacing every post-tax expenditure values with the correspondent average within the same *k*-group of pre-tax expenditure equals: G^{a^*}

[27] For instance, re-ranking effects may carry a different re-distributive impact depending on the ranks of the distribution involved. On the other side, horizontal inequity targets groups of individuals who are supposed to receive the same tax treatment and deviations from this principle may be considered acceptable in the presence of special needs (for the case of indirect taxation).

[28] Plotnick (1981) argues how the analysis of horizontal inequity depends from the reliability that the pre-tax distribution can be assumed as fair. That is rarely the case in an empirical analysis. However, "most persons tacitly accept the fairness of the pre-distribution ranking when making judgments on redistributive equity, a useful measure of inequity (useful in the sense that it *measures a phenomenon of public concern*, even if the concern is partly based on perhaps faulty perception) must also accept this ranking" (Plotnick, 1981, p. 283).

[29] In the case of indirect taxes (and in absence of further information on consumption patterns of families), Decoster et al. (1997) interpret pre-tax expenditure as a proxy of the endowment of the household. This interpretation has been adopted by the present work.

- the weighted average of the Gini post-tax expenditure values within each k-group, where $\widetilde{w}_k$ is computed as the product of the population and budget shares: $\sum_{k=1}^{N} \widetilde{w}_k \, G_k^a$
- the re-ranking effect: R

$$G^a = \left(G^{a^*} + \sum_{k=1}^{N} \widetilde{w}_k \, G_k^a + R\right) \quad [3]$$

The vertical effect is captured by the difference between Gini pre-tax and Gini post-tax expenditure under the effective tax schedule $T(x)$, which on average converges towards T^h. This can also be expressed through the Kakwani index (K_T), which captures the change in progressivity of the distribution due to the introduction of a tax schedule (where g represents the aggregate tax level)[30]:

$$V_G = \left(G^b - G^{a^*}\right) = \left(\frac{g}{1-g}\right) K_T \quad [4]$$

The second term in equation [3] identifies the horizontal effect given by deviations around the mean values caused by households' heterogeneous preferences among the same k-group of "equals":

$$H_G = \sum_{k=1}^{N} \widetilde{w}_k \, G_k^a \quad [5]$$

As the Gini index fails to unambiguously identify horizontal and vertical effects, the residual term of re-ranking has to be defined. Atkinson (1980) and Plotnick (1981) propose a method to measure the re-ranking effect as a sub-area of the Lorenz curve. In particular, Plotnick (1981) show how the Pre-ordered Inequity Index (PII) is obtained as the area between (1) the Lorenz curve obtained for the post-distribution given the post-distribution ranking and (2) the Lorenz curve for the post-distribution while individuals are ranked on the basis of the pre-tax distribution. The value of this area is then normalised to assume values between 0 and 100, where PII equals 100 when the poorest unit in the distribution becomes the richest one (i.e. there is a complete reversal of the ranking). This is equivalent to the Atkinson-Plotnick measure of re-ranking expressed as:

$$R_{AP} = G_y - C_y = \left(\frac{2}{\bar{y}}\right) Cov\big(y, F(y)\big) - \left(\frac{2}{\bar{y}}\right) Cov\big(y, F(x)\big) \quad [6]$$

Where x and y are respectively the pre- and post-tax expenditure, and C_x is the concentration index of the post-tax distribution when individuals are ranked on the basis of their pre-tax

[30] More specifically, this approach extends the decomposition proposed by Kakwani (1984) such that $L = G_x - G_y = \left(\frac{g}{1-g}\right) K - R$, where g represents the aggregate tax rate and $K = C_t - G_x$ measures the tax disproportionality, give that C_t measures the tax concentration. Note that $G_x - G_y$ is the Reynolds-Smolensky (1997) measure.

values. Note that R is computed on the ungrouped population and it is therefore not subject to the criterion associated to the grouping of units.

As a result, given definitions [4], [5] and [6], it is then possible to express the overall redistributive effect as:

$$RE_G = \left(G^b - G^{a^*}\right) - \sum_{k=1}^{N} \widetilde{w}_k \, G_k^a - R = V_G - H_G - R \qquad [7]$$

which leads to the proposed decomposition.

As outlined previously, this approach developed by Aronson et al. (1994) has been revisited by Lambert and Ramos (1995, 1997a, 1997b) who instead adopt the Mean Logarithmic Deviation (MLD) as a measure of inequality. As the MLD belongs to the generalised entropy family, it has the convenient property of being an additively decomposable inequality index. Therefore, the redistributive effect can now be decomposed in a weighted sum of the inequality *within* groups plus the inequality *between* groups by replacing the mean of each subgroup to the single values. Lambert and Ramos (1995) show that these two measures identify the vertical and horizontal re-distributive effects of a tax when the grouping of units is done using the pre-tax base measure. Hence, the redistributive effect can be decomposed as:

$$RE_{MLD} = J^b - \left(J^{a^*} + \sum_{k=1}^{N} w_k \, J_k^a\right) = \left(J^b - J^{a^*}\right) - \sum_{k=1}^{N} w_k \, J_k^a = V_{MLD} - H_{MLD} \qquad [8]$$

Given the convenient properties of the MLD, the decomposition from Lambert and Ramos (1995, 1997a) excludes re-ranking effects and adopts a "pure" system of weights (w_k) which only depends on the population share for the *k*-groups. In this sense, the interpretation of this approach is more straightforward than the Gini decomposition as the weights are now independent from the vertical inequity associated to the tax base budget shares[31] (Lambert and Ramos, 1995; Ven et al., 1998). Moreover, in the approach proposed by Aronson et al. (1994) both measures of horizontal inequity and re-ranking identify the heterogeneous effect of different household abilities and characteristics[32], while in this approach this is uniquely captured by H_{MLD}. On the other side, when using sample micro-data it is likely to expect a very low presence of exact equals. Hence, the Gini decomposition may provide a useful insight of the impact on the overall redistribution of the ranking of individuals when grouped in near-groups of equals (Lambert and Ramos, 1995).

[31] "A generalised entropy index captures the *wastefulness* of inequality, whilst the Gini coefficient captures the *unfairness* of inequality" (Lambert and Ramos, 1995, p. 12).

[32] In the case of indirect taxation, this implies that it is not possible to separate the effect of tastes and preferences due to horizontal inequity or re-ranking when the Gini approach is employed. However, the re-ranking effect should result very marginal in the case of indirect taxes (contrarily to the income tax). Therefore, both inequality measures are adopted in the present work.

As in the previous contribution, the vertical action of the tax can be thought as the difference between pre-tax expenditures and the average post-tax expenditure values computed for each *k*-group of equals (i.e. between variation). Accordingly, horizontal inequity can be seen as the distance between post-tax expenditures within each *k*-group of equals which before tax displayed the same level of expenditure (i.e. within variation).

Formally, the vertical effect is captured by transforming the post-tax expenditure distribution by replacing every single value with the post-tax expenditure average within each *k*-group of equals:

$$y \rightarrow \mu_k \qquad [9]$$

In this sense, the horizontal effect can be seen as the further reduction in inequality necessary to generate the same tax revenue in the absence of horizontal inequity (Lambert and Ramos, 1997).

However, from an empirical point of view, expenditures are recorded as continuous variables at a household level. These two factors pose the problem of identifying groups of "equal" tax payers presenting the same values of family pre-tax monetary expenditure. It is then necessary to state a criterion in order to *identify* "close" groups of equals that can reliably reflect the principle of horizontal inequity adopted. Such a choice is arbitrary and, as stated previously, depends on the nature of the analysis. Next section will outline the criteria of horizontal inequity adopted by the authors who applied this methodology for the indirect tax case. Meantime, assuming that a coherent principle of identification of "close equals" is found, it is possible to transform the above decompositions into "pseudo horizontal" and "pseudo vertical" effects for close groups of equals. This implies that the redistributive effect and its components now measure the *aggregate* effect in inequality among households in the same group.

Assuming that individuals can be grouped in reliable bands of close equals S_i on the basis of their pre-tax expenditure values, such as:

$$S_i = U_{a_i<y<a_{i+1}} S(x) \qquad [10]$$

It is then possible to express the pseudo-vertical and horizontal effects as

$$PV_{MLD} = \left(J^{b^{**}} - J^{a^{**}}\right) \qquad [11]$$

$$PH_{MLD} = \sum_i w_i \left(J_i^a - J_i^b\right) \qquad [12]$$

PV_{MLD} expresses the reduction in inequality *on average* given the introduction of the tax between *i*-close-equals groups while PH_{MLD} represents the *aggregate* deviation within S_i given the population shares of each *i*-group.

Calling $\varphi(i)\ and\ \mu(i)$ respectively the pre- and post- tax mean expenditure[33], Lambert and Ramos (1997a) show how the difference of these means, $\tau(i)$, approaches $T(x)$ when the class width defining groups of close equals S_i narrows.

$$\tau(i) = \varphi(i) - \mu(i) \quad [13]$$

$$T(x) = T^h - \varepsilon^h(x) \quad [14]$$

Where equation [13] shows the difference from the mean values pre- and post- tax expenditure distribution for the close-equals groups which for sufficiently narrow S_i approaches the true tax liability, expressed by [14].

In conclusion, it is possible to express the decompositions proposed by Aronson et al. (1994) and Lambert and Ramos (1997a), respectively for the Gini index and the MLD, in terms of "close groups of equals" (S_i) as:

$$RE_G = \left(G^{b^{**}} - G^{a^{**}}\right) - \sum_i \widetilde{w}_i \left(G_i^a - G_i^b\right) - R = PV_G - PH_G - R \quad [15]$$

$$RE_{MLD} = \left(J^{b^{**}} - J^{a^{**}}\right) - \sum_i w_i \left(J_i^a - J_i^b\right) = PV_{MLD} - PH_{MLD} \quad [16]$$

Note that, for the case of the Gini decomposition, the re-ranking effect R does not depend on the class widths as it is calculated using ungrouped data. In this sense, R incorporates the rank reversal of all the units from the transition from a pre-tax to a post-distribution scenario.

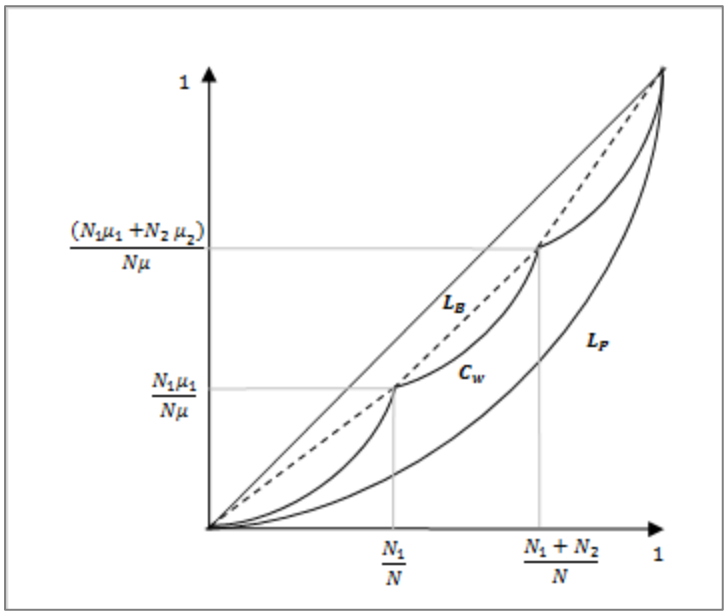
When RE is positive, the introduction of a tax in the system overall acts to reduce the inequality of the original distribution (which is assumed to be the redistributive benchmark). Positive values of PV imply a reduction *on average* of the inequality amongst close groups of equals from the transition from pre- to post-tax distribution. Instead, when PH is positive this means an increase of the horizontal inequality (i.e. of the dispersion of the tax treatment) within the *i*-close-equals groups and, therefore, a reduction of the overall redistributive effect of the tax.

2.1.3. Horizontal inequality and Lorenz Curve

The Gini decomposition of the overall redistributive effect into horizontal, vertical and re-ranking components originally proposed by Aronson et al. (1994) can also be expressed through the Lorenz Curve, as highlighted by Ven et al. (1998).

[33] $J^{b^{**}}$ and $J^{a^{**}}$ are the inequality indexes obtained by replacing the individual values of pre- and post-tax distributions with the corresponding mean of each subgroup of "close equals".

Figure 2.2. Decomposition of Gini inequality through the Lorenz Curve



Source: Ven et al. (1998)

Given N individuals, it is possible to group and rank them on the basis of their average expenditure μ_k for each k-group. Figure 2.2 shows the Lorenz Curves obtained given 3 groups of population (k=3).

The between-group Lorenz curve L_B is obtained by replacing the mean expenditure μ_k for each k-group. Note that in each k-subgroup L_B would simply be the 45° degrees equality line (hence the particular shape of connected lines of L_B). The between-groups Gini (G_B) can then be measured on aggregate as the area between the absolute equality line and L_B.

On the other side, the within group inequality (G_w) can be expressed as twice the area between the within concentration curve (C_w) and the between-group Lorenz curve (L_B), where C_w is obtained by ranking individuals on the basis of their true expenditures values within each k-group. The distance between C_w and L_B shows the departures of the true values from their group average.

As the departure of C_w from L_B is proportional to the departure of L_B from the 45° curve of absolute equality, it is possible to compute the aggregate G_w by multiplying for the weight given by the area in which k-group of population spans, which is equal for group 1 to $\left(\frac{N_1\mu_1}{N\mu}\right)\left(\frac{N_1}{N}\right) = \left(\frac{N_1^2\mu_1}{N^2\mu}\right)$.

Hence, within group inequality can be expressed as the sum of the Gini index calculated within every k-subgroup weighted for the population and budget share (α_k):

$$G_w = \sum_{k=1}^{K} \frac{N_k^2 \mu_k}{N^2 \mu} G_k = \sum_{k=1}^{K} \alpha_k G_k \quad \text{[i]}$$

Alternatively, G_w can be measured as the difference between the concentration index of C_w and the between Gini measure.

$$G_w = I_{C_W} - G_B = \left(\frac{2}{\bar{x}}\right) Cov\big(x, F(\mu_k)\big) - G_B \quad \text{[ii]}$$

where $F(\mu_k)$ is the proportion of individuals with expenditures ≤ μ_k given the ranking structure of the concentration curve C_w.

As individuals have been grouped following an arbitrary criterion, it is possible that some individuals in group *k* would present values of expenditure higher than a unit in group *k+1* and vice versa. That is due to the fact that individuals have been first ranked on the basis of their group average, and then a ranking of their individual expenditure values occurred within each group. This "residual" (E) is expressed by the difference between (1) the Gini computed on the Lorenz curve drawn for the whole population (G) ranked simply on their single expenditure values (L_P) and (2) the concentration index I_{C_W} calculated when individuals are first ranked following the grouping criterion :

$$E = G - I_{C_W} = \left(\frac{2}{\bar{x}}\right) Cov\big(x, F(x)\big) - \left(\frac{2}{\bar{x}}\right) Cov\big(x, F(\mu_k)\big), \quad \text{[iii]}$$

Which graphically is equivalent to twice the area between L_P and C_w.

This lead to the following identity:

$$G = G_B + G_W + E \quad \text{[iv]}$$

Which shows how the Gini index cannot be uniquely decomposed in between and within variation, leaving out a residual term (E).

Going back to the Gini decomposition of the overall redistributive effect (RE) applied to the case of indirect taxes, let's denote pre- and post-tax expenditures respectively with x and y. Thus, identity [iv] can be expressed as

$$G_x = G_{B,x} + G_{W,x} + E_x \quad \text{[v]}$$

$$G_y = G_{B,y} + G_{W,y} + E_y \quad \text{[vi]}$$

As the overall redistributive effect is defined as the difference between Gini pre- and post- tax expenditures, combining equations [v] and [vi] leads to expression [vii]:

$$RE = G_x - G_y = (G_{B,x} - G_{B,y}) - (G_{W,y} - G_{W,x}) - (E_y - E_x)$$
$$= (G_{B,x} - G_{B,y}) - \left(\sum_{k=1}^{K} \alpha_{k,y} G_{k,y} - \sum_{k=1}^{K} \alpha_{k,x} G_{k,x} \right) - (E_y - E_x)$$

When it is possible to identify exact equals and to group the population accordingly, then $G_{k,x} = 0$ and $E_x = 0$, so that the Gini between for pre-tax expenditure is identified by the Gini computed on the whole population ($G_x = G_{B,x}$). Finally E_y identifies the re-ranking effect of the decomposition as by definition $E_y = \left(\frac{2}{\bar{y}}\right) Cov(y, F(y)) - \left(\frac{2}{\bar{y}}\right) Cov(y, F(x)) = R$.

Once individuals are grouped by a "close-equals" criterion $S_i = U_{a_i<y<a_{i+1}} S(y)$, equation [vii] can be transformed to measure the pseudo- vertical and horizontal effects:

$$RE_P = (G^{x^{**}} - G^{y^{**}}) - \sum_i \widetilde{w}_i (G_i^y - G_i^x) - R = PV_G - PH_G - R \qquad \text{[viii]}$$

With R only depending from the ranking of the pre- and post- tax distribution values and not from the grouping of units.

2.2. Horizontal Inequity for the case of indirect taxes

As Plotnick (1981) points out, horizontal inequity ultimately relates to the fairness of the taxation process. However, the translation of this principle into a measurable concept is not an obvious task (Salanié, 2011). Following the past contributions, this work interprets horizontal equity as the concept that every taxpayer with the same tax base should be liable of the same tax burden. Such a definition is not straightforward as it requires a specification of how taxpayers are defined, what tax base measure is employed and how to compare these taxpayers on the basis of their ability to contribute to the tax. All these definitions implicitly depend on the framework of taxation considered and on the empirical measure chosen for the tax base.

In the case of VAT the taxable unit is the final consumer and the tax base is consequently represented by all the goods and services consumed by individuals and not used as an input of production. However, micro data on consumptions are collected through surveys which look at the expenditure records of a representative sample of families. The use of micro-data is made necessary as the current differentiate structure of VAT rates impedes any micro-simulation analysis based on large macro-aggregate categories of goods and services[34]. More specifically, the aggregation of these data into macro-categories would fail to capture the real effect of VAT on final consumers. Furthermore, expenditure budget surveys are generally collected at a family

[34] Some micro-simulation models based on Engel curves suffer from the need to reduce the number of categories of consumption considered. They suffer from a trade-off between the "estimability" of the model and the associated loss of relevant information when aggregating expenditures in "too" broad macro-categories.

level to account for economies of scale within the household. It is therefore necessary to choose a set of criteria to attribute family expenditure values to each single member of the household. This equivalence problem will be treated in a separate section; however, it is important to keep in mind how the results of the analysis depend on the choice of the equivalence scale adopted and, in this sense, they incorporate an implicit judgment on consumers' behaviour.

In the present work, horizontal inequity will be measured in terms of the inequality associated to the VAT paid among final consumers considered equal on the basis of their net expenditure values. The underlying assumption behind this definition is that, in the case of taxes levied on consumption, horizontal inequity and re-ranking effect arise from the heterogeneity of tastes and needs in households with similar levels of expenditure (Creedy, 1999).

The choice of considering monetary net-expenditures as an adequate proxy of the consumption of the household bears a number of important implications. First, the use of net expenditures as a benchmark measure of the ability to pay of final consumers implies that the current pre-tax distribution of expenditure is assumed as fair[35] (Plotnick, 1981). Second, the wellbeing associated to the consumption of taxpayers is measured through a financial measure, which may fail to account for relevant differences not reflected by the monetary value of the expenditures recorded.

In their work covering the Belgium indirect tax system, Decoster et al. (1997) approximate the household welfare using net equivalent total expenditure as a monetary proxy of the *endowment* of the household. As pointed out by several authors (Decoster et al., 1997; Kaplanoglou and Newbery, 2008) the adoption of a monetary measure - as for the case of net equivalent expenditure - does not represent *per se* an optimal proxy of the household welfare. However, as this analysis is based on the presence of heterogeneous and unpredictable preferences and tastes, the definition of a welfare measure using utilitarian approaches does not seem feasible. In this sense, it is not clear which model would be best to adopt given pure heterogeneous individual behaviours while it is not possible to make any firm assumption on the behaviour of individual level preferences (Creedy, 1999). This also implies that no form of compensation can be modelled on the basis of the results arising from this approach.

At this purpose, the present analysis does not rely on a pure differentiation of consumers on the basis of their monetary values. Instead, it takes into account some specific needs and relevant habits of consumption that can help identifying "equal" consumers beyond the "pure" total expenditure value. In this sense, it would be more correct to define the concept of horizontal equity adopted as the "requirement that the effect of the tax system on individuals should not

[35] In the sense that it represents the redistributive benchmark for the analysis.

vary with respect to irrelevant characteristics" (Salanié, 2011, p. 170). The work explores which characteristics should be considered "relevant" and argues about the normative interpretation of such assumptions, assuming an underlying distributional aim of the legislator in the design of the current VAT structure. In addition, this definition of horizontal equity associated to the design of a tax implicitly embodies a life-cycle perspective of the fairness of the tax treatment (Salanié, 2011). In the case of indirect taxes such concern corroborates the adoption of expenditure as the identification measure, which it has been previously argued representing a more stable proxy of individuals' wellbeing than annual income.

Furthermore, the choice of assuming constant values of expenditure[36] allows capturing the heterogeneity of the given household budget shares with respect to the VAT rate structure (Creedy, 1999). Hence, a simulation based on the decomposition presented will look at the distributional *impact* of different structures of VAT, given the current budget shares and assuming that the underlying current distribution can be assumed as a benchmark for comparison[37].

2.2.1. The identification problem

The analysis of horizontal inequity bears an *identification problem* in determining (1) who should be considered eligible of the same tax treatment given sample data of a population and (2) the heterogeneity in non-observable characteristics among tax payers (Lambert and Ramos, 1995). The first problem has been addressed by Lambert and Ramos (1995, 1997a) and Ven et al. (1998) who propose a methodology to consistently identify groups of close-equals. The second issue entails which characteristics should be considered relevant for comparing tax payers "horizontally" and what are the normative implications associated to the criterion of horizontal inequity. This latter point will be instead treated in the following section.

As expenditure is recorded as a continuous variable in family budget survey data, the identification of exact equals on the basis of the same value of equivalent pre-tax expenditure is not feasible. However, in their work Lambert and Ramos (1997a) show how to estimate a robust aggregate version of horizontal and vertical effects when individuals are partitioned in suitable groups of "close equals". That is, once the class width of these groups of close equals is defined accordingly to the sample structure and in order to maximise the vertical effect captured by the pseudo-decomposition, it is therefore possible to reliable estimate the

[36] The assumption of constant expenditure values arises from the assumption that a change in the VAT rate is fully reflected in the final price of the good or service, given constant prices of production.
[37] Note that, under the constant expenditure assumption, the inequality of the net-expenditure distribution is equivalent to the inequality measured in the case of a uniform VAT rate applied to all goods and services.

magnitude of the horizontal effect for the sample population as a residual term (Ven et al., 1998).

Before outlining how to identify the optimal bandwidth, it is important to highlight how crucial is for the analysis to find an appropriate criterion to convert family data into equivalent individual values. Such a requirement is made necessary by the fact that expenditures are generally recorded at a family level, as consumption choices depend from the economies of scale generated within the household. Previous contributions of the pseudo-decomposition approach employed standard equivalence scales. In general, these scales provide a set of coefficients to correct for the presence of economies of scale within the household which, in most of the cases, are mainly imputed to the size and to the composition of the family. However, when identifying groups of "close-equals" taxpayers by their monetary value of pre-tax expenditure, such a traditional equivalence criterion cannot be considered sufficient as relevant needs or particular habits of consumption can affect the significance of the comparison. Furthermore, as pointed out by Kaplanoglou and Newbery (2008), the choice of a standard equivalence scale implicitly assumes a full inter-household comparability of wellbeing, which associated to a financial notion of welfare may result in a rather poor measure. At this purpose the approach followed introduces the analysis of consumption patterns proposed by Decoster et al. (1997) and, drawing from the richness of the information contained in the expenditure micro-data, identifies some relevant needs and habits of consumptions that characterise the presence of horizontal inequality measured within the sample data. Not secondarily, such analysis provides some insight on the link between expenditure values and consumption patterns, and ultimately sheds some lights on the criteria of identification of horizontal inequity adopted[38].

Only once expenditure data are acceptably converted into equivalent individual expenditure values it is possible to regain the optimal bandwidth given the sample characteristics of the population under investigation. Thus, let's define with $S(i)$ the band width resulting from the grouping procedure of "close equals" on the basis of their equivalent pre-tax expenditure. Intuitively, when increasing the width of $S(i)$, the estimation of the distributional impact of the effective tax schedule improves as the broadening of the close-groups reduces the disturbance caused by the random error term. As the vertical effect is measured as the between variation within averages values of the effective tax schedule, the larger the width the more stable the mean values would result. On the other side, a wider class width implies that the accuracy of the

[38] The sensitivity of the results obtained with respect to the choice of the equivalence criteria will be tested alongside with the robustness of the band width associated to the identification of groups of close equals. Such a choice is perfectly in line with the previous works as the choice of the equivalence scale implicitly reflects the concept of horizontal inequity adopted (Kaplanoglou and Newbery, 2008).

vertical effect of the tax is reduced, as the horizontal effect captures the heterogeneity resulting from groups of taxpayers with different tax liability ("appropriation effect").

There is therefore a trade-off in terms of the choice of the band width between the loss of information captured by the horizontal effect and the accuracy of the estimation of the vertical redistributive power of the effective tax schedule. Ven et al. (1998) provide evidence that robust estimates of the effect of horizontal inequity for close groups of equals can be achieved by selecting the class width which minimises the decomposition error. More interestingly, their work suggests a methodology to identify the error associated to the pseudo measures of horizontal and vertical effects when using close-groups of equals.

The narrowing or, more specifically, the averaging power associated to the width of the partition chosen depends on the sample population. As the sample size increases, the number of units captured in each group of close-equals grows larger and reduces the need to increase the width of the interval. As Ven et al. (1998) point out, in the ideal case of a full population, the numbers of units captured in each sub-groups would approximate the exact groups of equals and the band width of the groups would become irrelevant. This implies that, from the transition from smaller sub-samples to the full-sample, it is possible to identify the class width that minimise the error associated with the estimates of the effective tax schedule.

In the extreme case of a unique class all the redistributive effect around the effective tax schedule would be captured horizontally. Hence, it is possible to define an upper threshold value of the band width when the pseudo-horizontal effect is found negative. At this stage, by narrowing down the class width the pseudo-horizontal and –vertical effects will initially increase, converging at a certain point towards their true values, before starting to approach their minimum (Lambert and Ramos, 1997; Ven et al., 1998; Creedy, 1999). The optimal band width is then found when the additional gain in terms of accuracy of the estimates of the averaging effect is dominated by the loss of information associated to the "appropriation effect".

Ven et al. (1998) show how the error associated to the decomposition of close equals groups can be adequately approximated by the re-ranking index of Atkinson and Plotnick which does not depend instead by the grouping of units[39]. This index captures both the error of identifying horizontal inequity as the "appropriation effect" and the misspecification of the effective tax schedule associated to the averaging effect. Hence, the optimal bandwidth that minimises the decomposition error is found when the vertical effect is maximised given a progressive increase of values of $S(i)$. This can be tested for random sub-samples to show the robustness of the class

[39] Ven et al. (1998) identify the decomposition error (E_y) with the residual term resulting from the Gini decomposition in between and within variation.

width obtained. Once the maximum vertical effect is considered "stable" for that given band width, it is possible to estimate the horizontal effect as a residual term given the fact that the re-ranking index is known and does not depend on the class size.

The analysis of band width proposed by Ven et al. (1998) shows how the pseudo-decomposition does not provide *per se* a solution to the identification problem (Lambert and Ramos, 1997). Instead, the methodology behind the concept of pseudo-decomposition addresses a technical concern providing a quantitative approach to measure the vertical and horizontal effect when using household survey data. The identification problem arises instead from the *loss of information* associated to the definition of close groups of equals. That is, the identification problem ultimately arises from the theoretical choice of an empirical measure used to identify groups of pre-tax equals, and is itself related to the concept of horizontal inequity adopted. As highlighted by Lambert and Ramos (1997a), the use of sample data does not preclude the identification of horizontal effects. However, appropriate checks are necessary to ensure that the sampling representativeness has been preserved through the grouping process. This can be ensured repeating the analysis for random sub-samples and looking at the robustness of the results obtained. Such a procedure is able to tell whether the information lost from the transition from exact equals to close-equals groups has been compensated by a consistent quantification of the redistributive effect that would have not otherwise been possible with sample data.

2.2.2. The normative significance of horizontal inequity

In this type of analysis the concept of horizontal inequity refers to the different tax treatment of taxpayers who should be subject to the same tax liability. In this sense, the presence of horizontal inequity is interpreted as a local inequality measure, capturing the unequal treatment of individuals who are supposed to be treated equally. Hence, horizontal inequity measures the disparity arising from the introduction of a tax in the system, given a "fair" pre-tax distribution (Lambert and Ramos, 1995). Given these definitions, the previous sections outlined how taxpayers can be empirically defined "equals" but no explanation was provided regarding why taxpayers should be considered eligible of an equal tax treatment from a normative point of view.

In the case of a progressive income tax, the undesirability of strong horizontal effects may arise from the presence of hidden individual abilities or characteristics which are not accounted by the original design of the tax. As this set of underlying capabilities is not observable, it is possible that the tax burden levied on individuals with the same net income differs as a result of this heterogeneity. Furthermore, the progressive structure of the income tax is not continuous

as the tax base is banded into classes of income and allows a set of deductions and detractions on the basis of specific characteristics. Hence, a horizontal analysis can provide insights on the inequality in the tax treatment within individuals who present close equivalent pre-tax incomes, and show whether this effect results in consistent losses in terms of progressivity[40].

On the other side, in the context of an indirect taxes levied on consumption, it is unclear why the legislator should try to discriminate individuals on the basis of their arbitrary tastes and preferences. Some consumption choices are indeed driven by some special needs or conditions of the household, as the presence of disability that could be considered worth of a differential tax treatment. More importantly, in the case of VAT the benefit of reduced rates on certain goods and services does extend to all final consumers. Hence, differences in tastes between "equals" may reduce the distributional aim of the tax or, at least, discriminate among families who should receive a similar tax treatment. In the same way, differences in tastes and preferences between "unequals" may also lead to a reduction of the desired progressivity, as the magnitude of the horizontal effect may vary across the distribution. As the presence of reduced VAT rates implies the sacrifice of a consistent part of the tax base associated to the richest consumers, it is important to assess whether the distributional power of a multi VAT rate may be better achieved through alternative fiscal means. Not less importantly, in terms of effectiveness of the VAT design, the redistributive effect associated to a multi-rate structure should be able to overcome the losses in terms of efficiency resulting from the need to impose higher rates in order to compensate for the loss of revenue accompanying the adoption of reduced rates or exemptions on certain types of commodities (Creedy, 1999).

In this sense the analysis of horizontal inequity contrasts with more traditional methods, which measure the redistributive effect of an indirect tax through variations of the average incidence on budget shares once expenditure or income increase progressively. Nevertheless, horizontal inequity provides a corrective measure of the distributional impact of non-uniform scenarios of

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40 In order to investigate these differences, Aronson et al. (1994) and Ven et al. (1998) adopt a welfaristic approach to compare individuals on the basis of the original monetary annual income levels. In particular, Aronson et al. (1994) adopt the Welfare index proposed by Sen (1973) which express aggregate welfare as

$$W = \mu(1 - G) \qquad [a]$$

Where μ is the mean income and G the Gini coefficient. μG provides an "absolute" Gini measure and can be interpreted as a measure of the "cost of inequality" (Ven et al., 1998). The decomposition of the redistributive effect can then be transformed in terms of welfare premium (Aronson et al., 1994; Ven et al., 1998) as:

$$W_a - W_b = \mu(1 - g)\, RE = \mu\left\{\left[(1 - g)G_{B,b} - G_{B,a}\right] - \left[\sum_k^K \frac{N_k^2}{N^2}\left[\, G_{k,a} - (1 - g)G_{k,b}\right] - R\,\right]\right\} \qquad [b]$$

where G_B and G_k respectively defines the between and within Gini indexes.

Expression [b] measures the welfare premium as the difference in social welfare from the current system to a system with an equal proportional yield tax *g*. An advantage of this approach is that allows the use of "pure weights". As it is possible to note from expression [b] the Gini within equality now depends only from the population share (Ven et al., 1998).

indirect taxation whilst being independent from the correlation between the choice of the tax base and the tax paid, which is instead the case when measuring incidence on expenditure and income distributions.

3. Directions of reform for the Italian VAT system

In the current European framework, the adoption of a differentiated VAT rate structure has historically been driven by a strong underlying equity concern. A regime of reduced VAT rates has generally been applied to specific categories of goods and services with the aim of mitigating the (regressive) impact of VAT on low-income consumers, who tend to allocate a higher share of their income for personal consumption. However, from a policy perspective, it has been questioned (US Department of the Treasury, 1984; Mirrlees et al., 2011) whether such a system would represent the optimal tax alternative to achieve this goal. As consumption choices are ultimately the expression of arbitrary and heterogeneous tastes and needs, it seems legitimate to wonder whether the excessive fragmentation of VAT rates would generate a significant dispersion of the original redistributive effect among tax payers that should instead be liable of a similar tax treatment (i.e. horizontal inequality). Not less importantly, the presence of more suitable direct tax means to be employed for redistributive purposes casts some doubts on the effective convenience of adopting a largely differentiated VAT structure whilst sacrificing the desirable properties of efficiency and transparency associated to a uniform rate design.

Following the prior discussion regarding the optimality of VAT design in a real context of fiscal reform, this Chapter investigates the redistributive implications of revising the existing Italian VAT system towards a (more) uniform two-rate structure. Such a proposal would abolish the current intermediate VAT rate of 10 percent and would slightly broaden the tax base through the narrowing of the categories falling within the minimum rate regime. The four reform scenarios proposed in this micro-simulation are the expression of the trade-off between the increasing demand of revenue for financing the process of structural reforms required by the European Union and the redistributive concern of reducing this higher fiscal burden for households with lower expenditure capacity. The first two scenarios are designed on the current Italian three rate structure and based on the increase of revenue accounted in the recently approved budget provision for 2015. Given the same increase of revenue, the last two scenarios propose a two rate structure where fewer selected categories of commodities are subject to a more favourable tax regime. Under this framework, the analysis compares the redistributive impact of these four structures against the benchmark scenario of a uniform VAT rate, where the efficiency of the revenue collection would be maximised and the distortion associated to the presence of VAT minimised. The overall redistributive effect of VAT is then decomposed in a vertical and horizontal component through the methodology developed by Aronson et al. (1994) and Lambert and Ramos (1995,1997a) , providing insight on the balance

between the vertical action of the tax and the horizontal discrimination of the fiscal treatment associated to differences in tastes and preferences of final consumers. This approach shows how, given the same revenue, the proposed two rate structures would bring a higher vertical redistribution than the current system and would reduce the distortion arising from the heterogeneity of consumption patterns, ultimately maximising the redistributive potential of VAT whilst achieving a consistent increase of revenue.

3.1. Data and microsimulation model

The study employs data from the Italian Household Expenditure Survey[41] (HES) for 2012. The HES survey is run annually by the Italian Institute of Statistics (ISTAT) with the aim to collect information on expenditure patterns of Italian households. It provides micro-data regarding monetary expenditure of families and information regarding habits of consumption (as durables goods). At an individual level it contains information regarding age category, gender, status within the household, occupation and level of education of all members of the household. The survey has national coverage and around 28,000 families were interviewed in 2012[42].

The survey adopts a two-stage sampling methodology. It first carries out a stratification of the municipalities on the basis of their typology, demographic size and geographical region in order to preserve the national coverage. This first phase allows identifying a pool of municipalities from which a small subset is randomly selected. Then, a set of households within these specific municipalities is randomly drawn, and members of the household are identified through a residence criterion via their local administrative records. Each family within the sample is asked to record a journal of their routinely expenditure for a period of seven days and then attend a face-to-face interview. The journal of expenditures can only be filled in one of the two weeks of the month originally selected by ISTAT, so that the information declared by the household can only refer to one of these periods. Afterwards, in the first week of the month subsequent the self-declaration the household is invited for the interview. Expenditure is generally recorded on a monthly basis but some categories of goods (i.e. durable goods and bills) are recorded quarterly and then converted to a monthly value through a particular procedure. In this way, the final dataset contains monthly expenditure data that can be annualised by multiplying by twelve months. However, in the present work HES monthly expenditure on durable goods and housing has been re-calculated using a depreciation schedule (see Table 3.1.) with the objective to smooth the impact of VAT on goods and services which tend to be consumed for a longer period than the one measured in the simulation (i.e. for more than one year).

[41] http://www.istat.it/it/archivio/4021 (Italian only)
[42] Note that the most recent waves of the survey are only comparable since 1997 as a significant reform of the methodology took place in 1996.

Table 3.1. Depreciation schedule and time coverage of durable goods and housing maintenance for HES data (Italy, 2012)

Durable goods	recorded	depreciation period
Housing		
Electrical kitchens	quarterly	36
Non-electrical kitchens	quarterly	36
Fridges, freezers	quarterly	36
Dishwashers	quarterly	36
Washing machines	quarterly	36
Cleaning appliances	quarterly	36
Heating, boilers and kitchen hoods	quarterly	36
Air conditioners	quarterly	36
Sewing machines	quarterly	36
Transportation		
Car (new)	quarterly	60
Car (used)	quarterly	60
Motorbike (new)	quarterly	60
Motorbike (used)	quarterly	60
Scooter (new)	quarterly	60
Scooter (used)	quarterly	60
Camper (new)	quarterly	60
Camper (used)	quarterly	60
Bicycle (new)	quarterly	36
Bicycle (used)	quarterly	36
Communication and leisure		
Land line phone	quarterly	36
Mobile phone	quarterly	36
Voice mail	quarterly	36
Fax	quarterly	36
TV	quarterly	36
TV recorder	quarterly	36
HI-FI	quarterly	36
Boat, tender, canoe, etc.	quarterly	60
Musical instruments	quarterly	60
PCs, laptops, tables, printers	quarterly	36
Cameras, Video-cameras, etc.	monthly	36
*Housing maintenance (non-ordinary)**		
Exterior renewals	quarterly	60
Interior renewals	quarterly	60
Renewal of water and sanitation systems	quarterly	60
Substitution of doors and windows	quarterly	60
Renewal or addition of heating and electronic systems	quarterly	60
Other non-ordinary maintenance	quarterly	60

*these categories refer to both expenditure of main and second house

The microsimulation employs HES expenditure records for 2012 to compute the VAT paid by each family for all the micro-categories of expenditure available in the survey. However, in a number of cases different rates of VAT apply within the same micro-category of expenditure stated in the questionnaire. This requires the computation of an average VAT rate for each of these mixed categories, which needs to be weighted for the relative contribution of each commodity included in the classification. For this reason, the work makes use of the weights available from the Italian Consumer Price Index (CPI) survey for the same year. Unfortunately the weights are not directly applicable to HES records as the classification of goods and services adopted in the two surveys differ as well as for the composition of the bundle. In order to obtain the correct weighted VAT rates it is then necessary to manually match the categories of expenditure between the two surveys. This explains how similar simulations using HES data may slightly differ in terms of the measurement of the VAT paid as, for the way this measure is computed, it incorporates some sort of arbitrary judgement regarding the attribution of the rates to the related expenditure categories.

On the same line, it is important to take into account how the use of HES data bears a couple of methodological limitations. Firstly, the HES survey does not provide reliable unit-level measures of family incomes, which are instead collected through a separate survey ran annually by the Bank of Italy (Household Budget Survey, henceforth 'HBS'). For the case of Italy, Pisano and Tedeschi (2014) show the complexity and criticalities in linking these data sources, as the two surveys present significant differences in terms of design and sampling structure (e.g. sample size, definition of household, etc.). The work of Pisano and Tedeschi (2014) employs a joint approach of probabilistic matching and imputation techniques[43] to link these data sources on the basis of a set of common socio-demographic characteristics of households. However, some significant discrepancies still persist in the lowest tail of the linked income distribution, where a large share of positive expenditure seems to be associated to zero-income values. As Pisano and Tedeschi (2014) argue, it is not straightforward to identify what are the underlying economic reasons behind the presence of these values (i.e. credit market, irregular incomes not properly recorded, tax evasion, low accuracy in the matching process). Not less importantly, the authors show how some categories of expenditure are more accurately recorded in the HBS data, which provide better figures regarding durable goods, savings, mortgages and private pensions. Under this evidence - and in line with the theoretical concern regarding the suitability of using annual incomes as the base measure for measuring the impact of VAT - the present analysis does not include income data. In this sense, the work of Pisano and Tedeschi (2014)

[43] Another matching approach makes use of using semi-parametric estimation of Engel curves (Decoster et al., 2006). However, this analysis requires a macro-aggregation of the categories of expenditure available. Hence, this method fails to capture the full information given by the detailed categories of consumption reported in the HES micro-data (Gastaldi et al., 2014), and appears to be less suitable for reform design purposes.

helps understanding the complexity in matching these two sources for the Italian case. More importantly, it shows how a poor matching tends to affect more significantly the quality of the linkage for units in the lowest tail of the distribution, which ultimately raises some concern regarding the joint use of these data sources for the redistributive focus of the present work.

A possible way to address this issue would be the matching of expenditure survey data with administrative records on taxable incomes. A legal way to match those records would be to ask for the consent of the families involved in the HES survey to link the information declared during the interview with their tax returns. Those data may then be employed to create a set of weighting coefficients that could be applied to the subsequent matches between HES and HBS data in order to correct the bias in the lowest tail of the linked distribution. The (safe) use of survey and administrative linked data sources is progressively becoming a broadly adopted methodological approach for socio-economic analysis in Scandinavian countries, Netherlands and United Kingdom (Administrative Data Taskforce, 2012), and those standards of "best practice" could potentially provide some useful guidance for the Italian case in overcoming the daunting issue of having reliable data on incomes and expenditures for policy analysis.

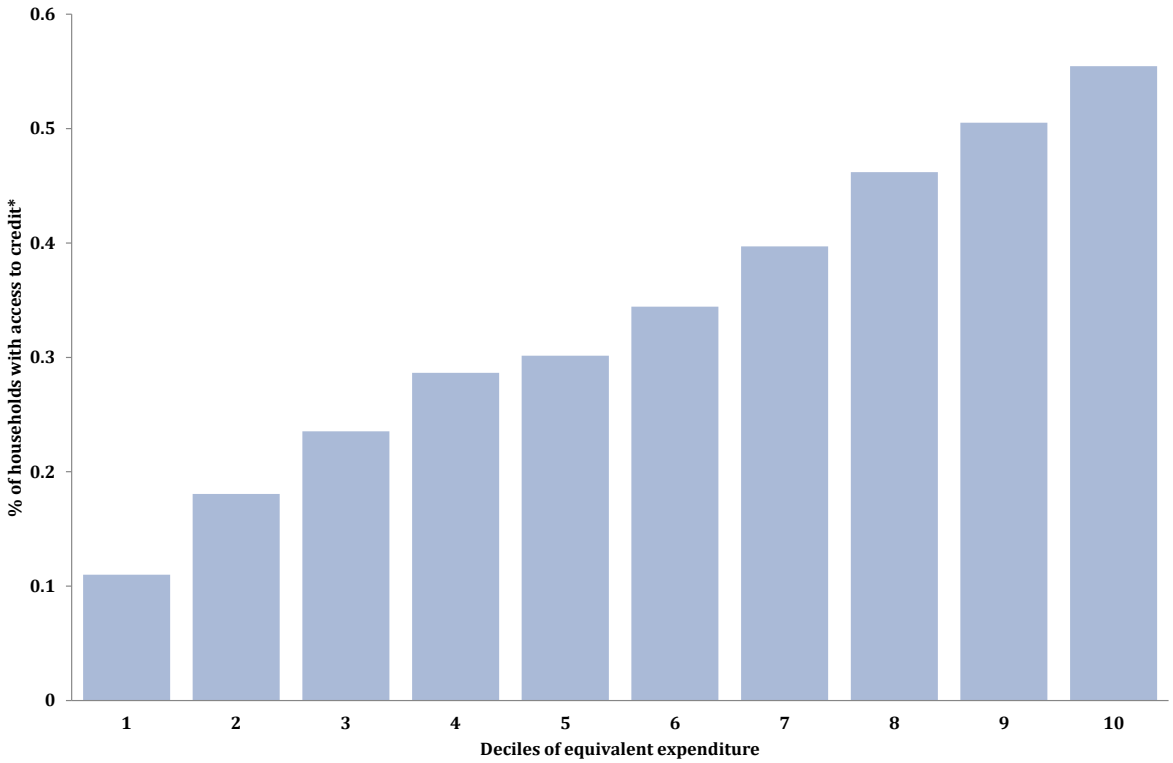
Another issue associated to the use of HES data regards its direct comparison with the existing macro data sources on expenditure. More specifically, aggregate statistics computed through HES data tend to underestimate the figures provided by the National Accounts (NA), as some categories of expenditure are recorded using different criteria. This mainly includes expenditures on durable goods, health, tobacco and the ones related to public or clerical institutions. In addition, the NA adopts a different criterion to distinguish between private and business activities which impedes any direct comparison between the two sources. This explains why the coverage rate of HES expenditure data is generally much lower than the NA figures for expenditures in those categories of goods and services. Despite this fact, the present estimates are in line with the measures obtained by previous empirical works using HES data (Gastaldi and Liberati, 1998; Cepparulo et al., 2012).

Finally, household expenditure data have been equalised through the OECD scale of the square root of the household size. Similar results are obtained with the OECD modified scale, however the first one has been preferred as the age classes of the survey were not perfectly aligned with the OECD classification of child members[44]. In the present analysis expenditure has been adopted as the base measure for quantifying the incidence on VAT on taxpayers (Mirrlees et al., 2011; Arsic and Altiparmakov, 2013). This choice is based on the assumption that expenditure patterns represent a better proxy of lifetime resources than annual income, as individuals tend

[44] More specifically, the OECD modified scale identifies a child below 14 years old while the age categories released by ISTAT for HES data cover the period 6-14 and 15-17, leaving out a small margin of error.

to smooth their consumption over time through the possibility to borrow and lend money over time (Friedman, 1957). As highlighted by Tax Research UK (2010), this argument is weakened by the fact that low-income families generally tend to have a restricted access to the credit market. In order to test this hypothesis, a basic index of the access to the credit market has been created using the information recorded in the survey regarding the presence of loan or mortgages and the use of credit for the purchase of goods and services. The statistics shown in Figure 3.1. highlight how effectively access to credit increases by decile of equivalent expenditure. This confirms the concern regarding the use of expenditure as the only base measure for assessing incidence of VAT when families with lower expenditure levels seem to be less able to re-allocate their consumption over time (Barrell and Weale, 2009). However, the overall coverage of the information available on the survey (below the 1 per cent) casts some doubts on the significance of the information used to build this index, so no definitive conclusion can be drawn from the data currently available.

Figure 3.1. Share of households with access to credit* per deciles of pre-tax equivalent expenditure (Italy, 2012)



*calculated on the basis of the information on presence of loans, mortgages or use of credit payment means reported in the HES questionnaire.

3.2. The simulation scenario

The design of the reform scenarios proposed in the present work starts form the provisions in terms of budget stability recently approved at the end of 2014 by the Italian parliament. More

specifically, in the latest government agenda an increase of the intermediate and standard VAT rates has been introduced as a safe guard clause for the higher share of government budget allocated towards structural economic reforms. Such approach is not new in the Italian framework, as the latest VAT increases are also accountable to prior legislative provisions for covering budget gaps. This has led to a progressive increase of the standard rate from 20 to 22 percent between 2010 and 2013 and, if the trend continues, can lead in 2018 to a raise of the current rates from 10 to 13 per cent (for the intermediate rate) and from 22 to 25.5 per cent (for the standard rate), while leaving the minimum rate at the current 4 percent (see Table 3.2).

Table 3.2. VAT reform scenarios for Italy (2012)

VAT rate	S-2012	S-2018*	S-1**	S-2**
		%		
minimum	4	4	8	5
intermediate	10	13	-	-
standard	21	25.5	24	23
		baseline 2012, mln €		
revenue	57,188	67,928	67,928	67,928

*as outlined in the legal provisions for the government budget agenda approved in late 2014 ("Legge di Stabilità")

** rates rounded to the closest integer

In order to account for this existing legislative framework, the three proposals of reform have been calculated on the basis of the same revenue that would be obtained under the VAT structure proposed for 2018 for expenditure values recorded in 2012[45]. The first two scenarios consist of a three-rate structure, the one legally adopted in Italy in 2012 (S-2012) and the one under the provisions for 2018 which, given the levels of expenditure recorded for 2012, would provide an additional revenue of 10 billion of euro, equal to an increase of 19 percent of the revenue estimated for 2012 (S-2018). As outlined in Table 3.3 the 2012 rate structure is still preserved for S-2018 but the average weighted VAT rate applied to each category of commodities shows a substantial increase.

On the other side, the two alternative scenarios present a two rate structure, where the first proposal presents a relatively wider range of categories of expenditure falling in the reduced regime (S-1) while the second one minimises the use of the reduced rate (S-2). Given the same increase of revenue calculated on the 2018 scenario, the abolition of the intermediate VAT rate for S-1 and S-2 results in a set of VAT rates generally lower than the ones prospected for 2018 by the government provisions. More specifically, the more redistributive scenario "S-1" presents

[45] The present work assumes constant expenditure shares in the simulation scenarios. This implies that the additional revenue obtained under the legal provisions for 2018 is calculated on the expenditure values recorded for the latest HES wave available (e.g. 2012).

a reduced VAT rate of 8 percent and a standard rate of 24 percent. On the other side, the more restrictive scenario "S-2" would only increase the current reduced rate to the 5 percent and raise the standard rate to the 23 percent.

Table 3.3. Reform scenarios calculated on pre-tax expenditure VAT structure for Italy (2012)

Categories of expenditure	Annual expenditure (2012)*	Budget share	VAT rates			
			S-2012 **	*S-2018* **	*S-1*	*S-2*
	mln €	*%*		*%*		
Food and non-alchoolic drinks	136.242	0,20	0,08	0,10	**0,08**	**0,05**
Alchool and tabacco	12.637	0,02	0,21	0,26	0,24	0,23
Clothing	36.507	0,05	0,21	0,26	0,24	0,23
House mantainance	6.384	0,01	0,16	0,19	**0,08**	0,23
Bills	54.012	0,08	0,12	0,16	**0,08**	0,23
Housing expenditure	24.025	0,03	0,21	0,26	0,24	0,23
Health	26.850	0,04	0,06	0,08	*0,00*	*0,00*
Private transportation and fuel	59.441	0,08	0,21	0,25	0,24	0,23
Public transportation	8.791	0,01	0,10	0,13	**0,08**	**0,05**
Communication	12.822	0,02	0,19	0,23	0,24	0,23
Education	6.285	0,01	0,00	0,00	*0,00*	*0,00*
Leisure	87.885	0,13	0,14	0,17	0,24	0,23
Books	6.240	0,01	0,09	0,10	**0,08**	**0,05**
Rents	178.114	0,26	0,00	0,00	*0,00*	*0,00*
Professional and techinical	9.454	0,01	0,09	0,11	**0,08**	**0,05**
Stamps	505	0,00	0,00	0,00	*0,00*	*0,00*
Other services and goods	32.921	0,05	0,03	0,03	0,24	0,23
Total	**699.115**	**1,00**	**0,10**	**0,12**	**0,12**	**0,12**
Annual revenue						
mln €			**57.188**	**67.982**	**67.982**	**67.982**
increase 2012-2018 (mln € and %)				*+10,794*	*+18.9%*	

* Some categories of expenditure have been re-evaluated on the basis of a depreciation schedule (see Table 3.1)

** weighted average VAT rates for HES micro-categories of expenditures

Note that expenditure for loans and mortgages has been excluded from the overall count as indicated in the methodological note from ISTAT

In addition, in the two proposals of reform the regime of exemptions has been extended to all the commodities which qualify within the criteria indicated by the European VAT directives[46]. This particularly regards health expenditure which is now fully exempted of VAT. This choice reflects the aim to conform to the related EU criteria but it also follows the logic to exempt those types of expenditure (like health and education) which are generally more easily identifiable and, thus, less likely to be affected by ambiguity in the tax treatment applicable. Alongside, the reduced rate regime has been maintained for all those categories that traditionally represent a high share of the budget of low-income families, as food and non-alcoholic drinks. This choice has been driven by the original aim to preserve the redistributive impact of the current VAT structure, and it has been strengthen in S-1 where the reduced VAT regime has been extended to the routinely expenditure for the house (as maintenance and utilities).

However, in these two VAT scenarios reduced rates now apply to the whole category of expenditure, with no differential tax treatment depending on some characteristics or on the use

[46] See European directives (67/227/EC and 67/228/EC).

of the specific good or service. This leaves very small room for any ambiguity regarding the tax regime that should apply and eliminates the existing discrimination arising from differences in tastes within the same typology of consumption. The remaining categories falling into the reduced VAT regime are public transport, books and professional services. Although the marginal contribution of the first two categories to the overall households' expenditure (less than 0.2 percent), the choice to apply a reduced rate reflects the intention to favour the consumption of goods that generates a positive externality for society, (as greener forms of transport and culturally relevant material). In the case of professional and technical services, the decision has been driven by the intent to discourage Do-It-Yourself activities and to favour those services that are complementary to work activities, as childcare.

Given these four VAT scenarios, the overall redistributive impact of VAT has been decomposed in a vertical component of redistribution and a horizontal element of inequality, where the latter is associated to the differential tax treatment accountable for differences in tastes and needs of taxpayers who should be instead liable of the same tax treatment. Following the methodological review presented in the previous Chapter, the decomposition of the VAT treatment has been first measured through the use of the Mean Logarithmic Deviation (MLD) index on the basis of expression [16]

$$RE_{MLD} = J^b - J^a = \left(J^{b^{**}} - J^{a^{**}}\right) - \sum_i w_i \left(J_i^a - J_i^b\right) = PV_{MLD} - PH_{MLD}$$

Equation [16] compares the MLD inequality index computed on *before*-tax expenditure with the resulting index for the *after*-tax distribution in each scenario. The MLD index expresses a measure of distance of individual values from their mean:

$$MLD = \frac{1}{N}\sum_i^N [\ \ln(\bar{x}) - \ln(x_i)\ ] = \ \ln(\bar{x}) - \frac{1}{N}\sum_i^N \ln(x_i)$$

At an aggregate level, the MLD indexes of inequality pre- and post- tax, J^b and J^a, have been computed as:

$J^{b/a} = \ln(\bar{x}) - \frac{1}{N}\sum_i^N \ln(x_i)$,

where

$\bar{x} = \ average\ monthly\ equivalent\ expenditure$;
$x_i = \ equivalent\ monthly\ expenditure\ for\ household\ i$;
$N = \ no.of\ households$;

and the prefix ^{b} refers to the expenditure values before tax and ^{a} identifies the inequality index computed on the after-tax expenditure distribution.

Note that J^{b} does not just measure the inequality associated to the pre-tax distribution but it also identifies the inequality related to a uniform VAT rate scenario applied to the distribution of expenditures for 2012. In this sense, the comparison between J^{b} and J^{a} also shows the redistributive improvement associated to a differentiated VAT structure with respect to the uniform benchmark scenario.

In order to define the vertical and horizontal effect of VAT, the households sampled in the HES survey have been partitioned in "close-equals" groups of taxpayers through an identification criterion based on their level of equivalent monetary expenditure prior VAT. In this analysis, monetary net expenditure is assumed to be a proxy of the initial endowments of families[47] (Decoster et al., 1997).

The vertical component of a tax (**PV**) is measured by the variation *between* of the expenditure distribution, by comparing the average computed for the whole population with the average expenditure values obtained for each subgroup of "close-equals". That is,

$$J^{b^{**}} = \ln(\bar{x}) - \frac{1}{K}\sum_{i}^{K} \ln(x_i) = \ln(\bar{x}) - \sum_{i}^{K} \ln(x_i)\, p_i$$

where

$\bar{x} = \ average\ monthly\ equivalent\ expenditure$;
$x_i = \ average\ equivalent\ expenditure\ within\ each\ k\ group$;
$K = \ no.of\ "close"\ equals\ groups\ k;$
$p_i = population\ share\ of\ each\ group\ of\ "close"\ equals\ k.$

The natural logarithm of the average expenditure for each subgroup has been weighted for the relative population weight, as the identification criterion defines groups of different size. The same calculation has been carried out for the after-tax distribution $J^{a^{**}}$ and the difference between the two indexes ($J^{b^{**}}$-$J^{a^{**}}$) measures the vertical redistributive effect of the VAT structure proposed.

On the other side, the computation of the horizontal component (**PH**) has been obtained by measuring the distance between the single individual values of equivalent household

[47] Following the work of Decoster et al. (1997), a parallel analysis of the determinants of horizontal inequality in terms of consumption patterns has been also carried out in the next section in order to provide some insight on the normative significance of the results obtained. This allowed to enrich the analysis and to strengthen the results providing further insight on the nature of the horizontal effect measured.

expenditure and the average expenditure calculated within their related subgroup of "close-equals" (variation *within*). Then, the horizontal effect of the whole population has been computed as the difference between the resulting MLD inequality indexes for the post- and pre-tax distribution, weighted by the population share of each subgroup of "close-equals". Analytically,

$$J_k^{b/a} = \ln(\bar{x}_k) - \frac{1}{N_k}\sum_{i}^{N_k} \ln(x_i)$$

Where

$\bar{x}_k = \ average\ equivalent\ expenditure\ for\ group\ k$;

$x_i = \ equivalent\ expenditure\ for\ each\ member\ of\ k$;

$N_k = \ no.households\ in\ group\ k;$

and J_k^b e J_k^a are the MLD inequality indexes before and after-tax obtained for each subgroup of "close-equals" k. The horizontal inequality effect is obtained by aggregating the difference of these two indexes weighted by the relative population size of each subgroup p_i:

$$PH_{MLD} = \sum_{i=1}^{K} p_i \left(J_i^a - J_i^b\right)$$

In other words, **PH** measures the "dispersion" around the mean of the VAT paid between households within a very small interval of (equivalent) expenditure, capturing the inequality in the fiscal treatment arising by the presence of different tax rates and diverse preferences of consumption. Positive values of **PH** measure the increase of horizontal inequality associated to the presence of the tax and, therefore, the reduction in the redistributive power. That is, the overall redistributive effect of the tax (**RE**) is obtained as a difference between the vertical and the horizontal effect with respect to the initial expenditure distribution (**RE=PV – PH**).

The same process has been replicated with a different measure of inequality, the Gini index. The decomposition through the Gini measure is characterised by the presence of non-pure weights, as the computation of the indexes depends also on the budget share of expenditure for each subgroup. In this sense, the use of the MLD index seems preferable, as the measure of horizontal inequality captured is not related to the vertical structure of the distribution (Lambert and Ramos, 1995; Ven et al., 1998). On the other side, the decomposition through the Gini index provides a useful measure of the degree of re-ranking amongst the households in the sample arising from the transition from pre- and post-tax distribution.

Briefly, the Gini decomposition can ultimately be expressed by equation [15]

$$RE_G = G^b - G^a = \left(G^{b^{**}} - G^{a^{**}}\right) - \sum_i \widetilde{w}_i \left(G_i^a - G_i^b\right) - R = PV_G - PH_G - R \ ,$$

where

G^b is the Gini inequality index of the before-tax distribution, which also measures the inequality of a uniform VAT scenario applied for the current distribution;

G^a equals the Gini inequality index of the after-tax distribution for different VAT structures;

PV represents the vertical effect of VAT, computed as difference between **G^{b**}** and **G^{a**}**, which are obtained by replacing the individual expenditure values with the mean of the related "close-equals" subgroup;

PH identifies the horizontal inequity of VAT, equal to the difference between **G^b** and **G^a** computed within each group of "close-equals". $\widetilde{\boldsymbol{w}}_{\boldsymbol{i}}$ is the composite weight of the population and budget share of each *k* group. Note that PH can also be obtained in a residual way as **PH=PV-R-RE** (Lambert and Ramos, 1997; Ven et al., 1998);

R defines the re-ranking effect, computed as the Plotnick-Atkinson index where **$R = G^a - C^a$** , and **C^a** is the tax concentration index computed on the households ranked on the basis of the pre-tax distribution.

Finally, as we are measuring horizontal inequality under the assumption that it is possible to identify reliably “close-equals” groups of taxpayers, it is important to highlight how the decomposition approach now measures the **P**seudo-Vertical and Horizontal effect of the tax (Aronson et al., 1994; Lambert and Ramos, 1995 and 1997). More specifically, the interpretation of these two effects now relates to the *average effect* of these components on the whole population.

3.3. Results

Using the micro-simulation model based on HES data and the four scenarios of VAT reform outlined previously, the aim of the analysis is to assess the opportunity, in terms of redistributive and revenue power, of migrating from the current Italian VAT system towards a more “efficient” two-rate structure.

A first look at the incidence of VAT for the scenarios of reform under analysis is shown in Figure 3.2. As expected by using expenditure as the base measure[48], the incidence of VAT on monetary equivalent expenditure shows a progressive trend amongst percentiles of distribution for all the VAT structures considered. Interestingly, given the same level of revenue, the two alternative VAT scenarios S-1 and S-2 show a lower VAT incidence for the bottom percentiles with respect to 2018 VAT structure. Alongside, the trend outlined in Figure 3.3. confirms how these two-rate structures tend to impact less on all types of families within the first two quintiles of the net equivalent expenditure distribution, when compared to the 2018 three-rate system. This is particularly true for households with relatively old members (over 65 years old) and single families both with no presence of children. On the other side, the increase of the incidence of VAT recorded in the last quintiles is quite marginal for all the categories of household, providing evidence on how the reform proposed is able to maintain the balance in the original redistribution of expenditure, if not even improving it. Finally, the decomposition of the incidence of VAT per geographical area of residence of the household highlights how VAT impacts slightly more on families living in the South of Italy (see Figure 3.4). However, compared to the richest quintiles of the expenditure distribution, the two rate scenarios have a more progressive structure than the three rates system independently on the geographical macro-area.

[48] VAT incidence measured on annual household income is *per se* regressive as the propensity to save increases with income, so that households in the higher tail of the income distribution will always allocate a minor share of their budget to consumption than families in the lowest part of the income distribution.

Figure 3.2. VAT incidence per percentiles of equivalent pre-tax expenditure per reform scenarios (Italy, 2012)

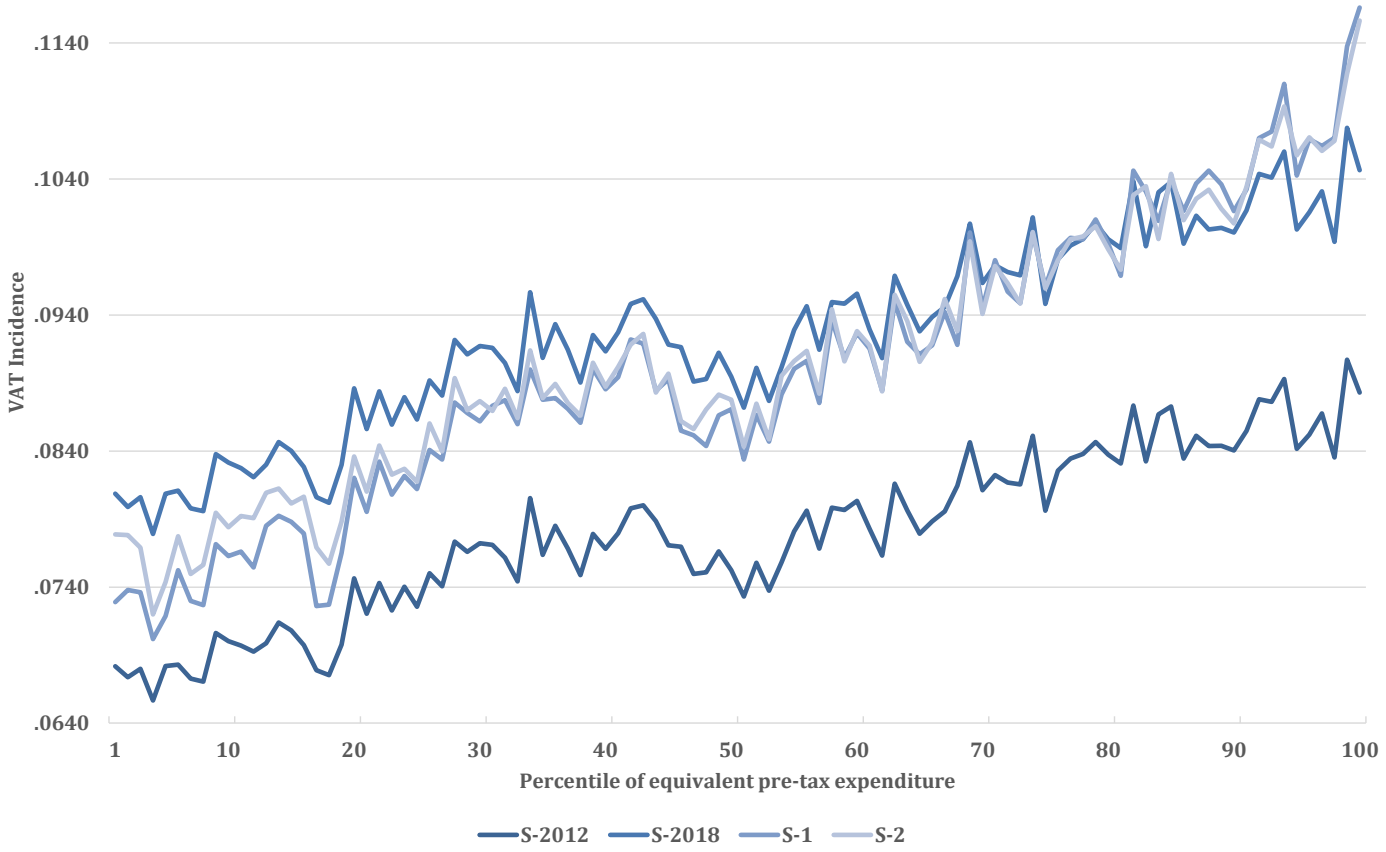


Figure 3.3. VAT incidence per household type and quintiles of equivalent pre-tax expenditure per reform scenarios (Italy, 2012)

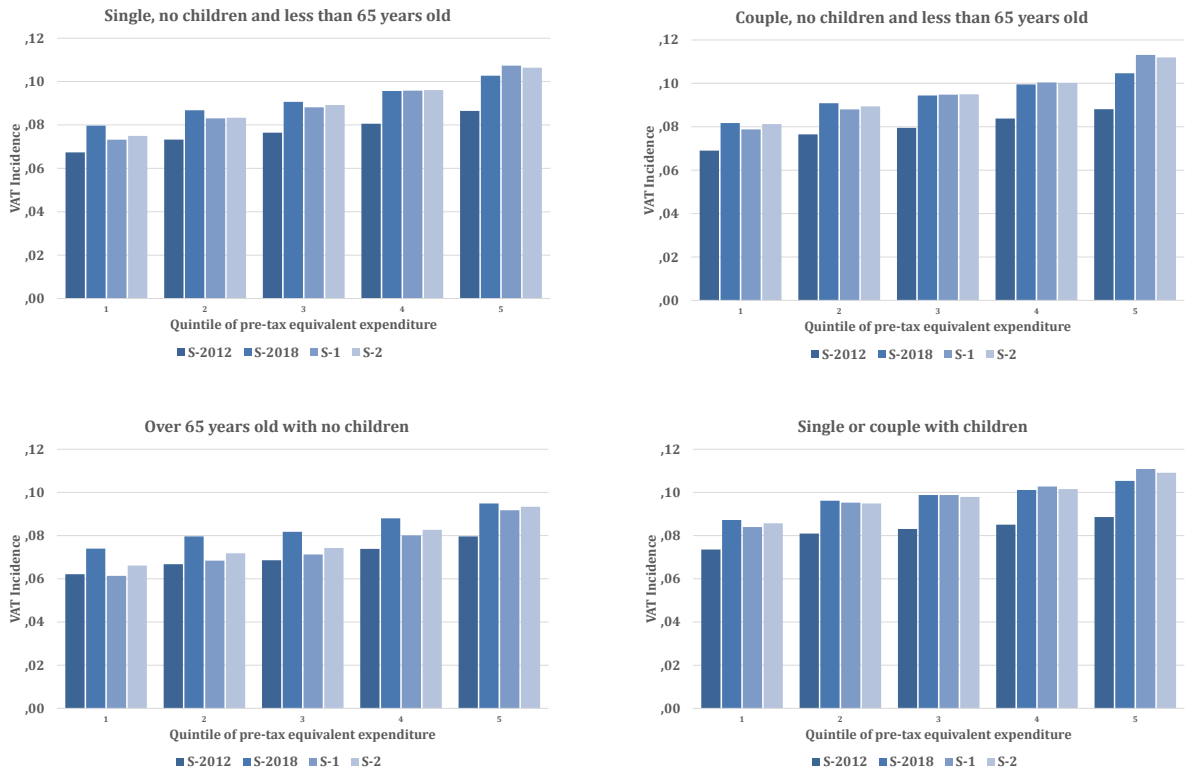
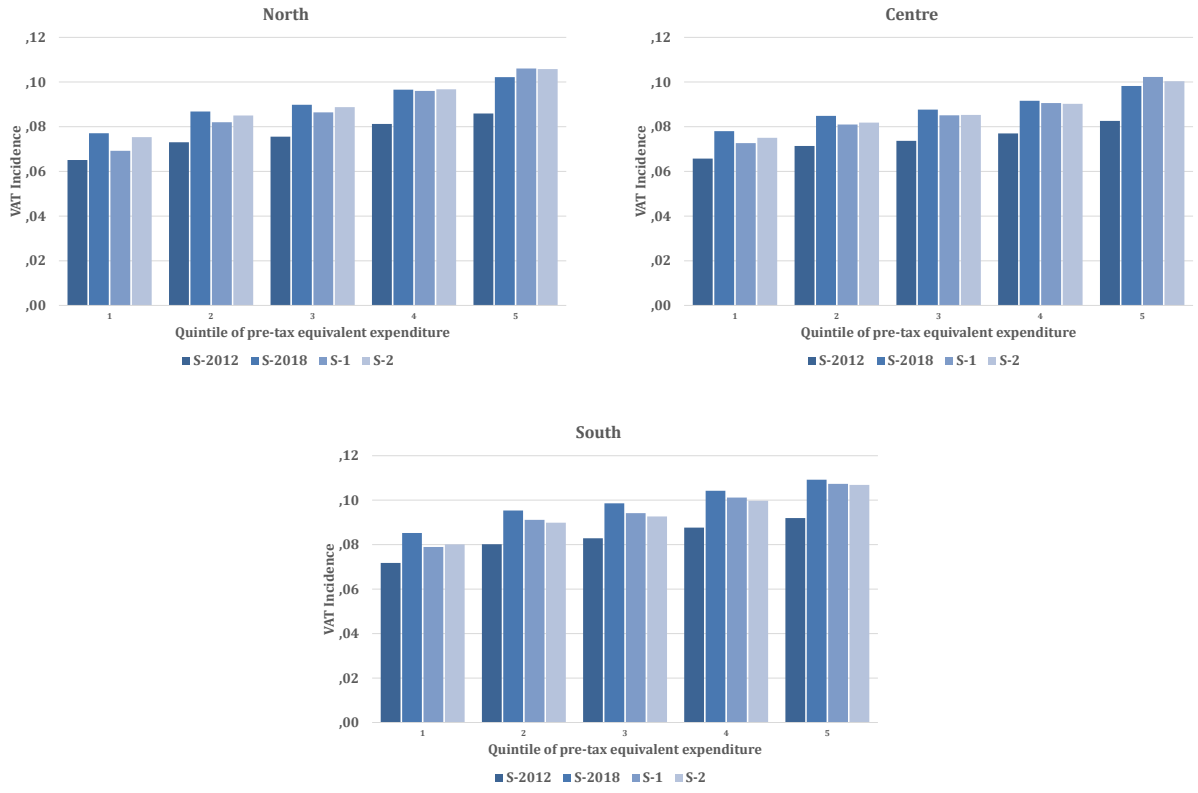


Figure 3.4. VAT incidence per geographical area and quintiles of equivalent pre-tax expenditure per reform scenarios (Italy, 2012)



These preliminary results are confirmed by the decomposition analysis of the redistributive effect of VAT presented in Table 3.4. The results shown have been obtained through the use of the MLD index and a band width of equivalent monetary expenditure of 35 euros[49].

Table 3.4. MLD decomposition of the overall redistributive effect of VAT reform scenarios for the Italian system (2012)

VAT scenarios	J^b	J^a	RE#	PV	PH	Ranking
			absolute values			*via RE*
S-2012	0.1358297	0.1329271	0.0029027	0.0031233	0.0002206	4
S-2018		0.1323637	0.0034660	0.0037799	0.0003139	3
S-1		0.1302958	0.0055339	0.0058849	0.0003510	1
S-2		0.1308096	0.0050201	0.0053396	0.0003195	2
VAT scenarios	J^b	J^a	RE*	PV	PH	PH/RE
			as percentage of J^b			*%*
S-2012	100	97.86	2.14	2.30	0.16	**7.60**
S-2018		97.45	2.55	2.78	0.23	**9.06**
S-1		95.93	**4.07**	4.33	0.26	6.34
S-2		96.30	**3.70**	3.93	0.24	6.36

Bandwidth = 35 €
No. classes = 225

where the overall redistributive effect of VAT is **RE = J^b - J^a = PV – PH**

J^b MLD inequality index of the before-tax distribution, which also measures the inequality of a uniform VAT scenario applied to the current distribution of pre-tax expenditures

J^a MLD inequality index of the after-tax distribution for different VAT structures

PV Vertical effect of VAT, computed as difference between Jb^{**} and Ja^{**}, which are obtained by replacing the individual expenditure values with the mean of the related "close-equals" subgroup

PH Horizontal inequity of VAT, computed as difference between Jb* and Ja* within each group of "close-equals". These two indexes capture the "dispersion" around the average of individual pre- and post- tax expenditures

First of all, as J^b does also measure the inequality associated to a uniform VAT scenario for the distribution of expenditure of 2012, it is possible to see how all the four differentiated VAT structures achieve a redistributive outcome, by reducing the inequality measured on the post-tax distribution with respect to the original one (i.e. $J^a<J^b$ for each scenario). However, in line with the trend of incidence of pre-tax equivalent expenditure, the alternative scenarios S-1 and S-2 seem to present a higher reduction of inequality (i.e. lower J^b) that the one experienced by S-2012 and S-2018, showing how diverse multi-rate VAT structures can have a different redistributive impact, which is not necessarily related to the variety of VAT rates applied on

[49] Similar results have been obtained with different intervals of bandwidth, equivalence scales and index of inequality measured which are outlined in the final section of the Chapter.

goods and services. As expected from the design of the reform proposals, the structure of VAT rates proposed in S-1 seems to be slightly more redistributive of S-2. However, the relatively higher redistributive power of S-2 is still consistent, especially considering the restricted number of categories falling in the reduced VAT regime and the lower VAT rates associated.

In terms of vertical redistributive power, the results for MLD confirm how all four VAT structures present a positive redistributive effect (PV>0). Interestingly, with respect to the initial distribution of expenditures, S-1 and S-2 present a higher vertical impact than the other two VAT structures. By equalising the PV effect using the level of inequality of the original pre-tax distribution (PV/J^b), the vertical effect found for S-1 and S-2 is significantly higher of at least one third than the levels associated to the three VAT scenarios for 2012 and 2018. This may be explained by the different way in which the reduced VAT regime was applied to the alternative scenarios. In particular, this augmented effect may arise from the choice of selecting fewer categories of expenditure and to broaden the reduced VAT rate to the whole set of commodities falling within those categories. In this sense, a higher vertical redistributive effect for S-1 and S-2 provides further evidence on how the excessive fragmentation of VAT rates in the current Italian system fails to optimally achieve its original redistributive aim.

It is important to remark again how the magnitude of the two components of redistribution should be analysed in relative terms, as the absolute values reported for PH and PV depends on the levels of the inequality index. This helps explaining how the two alternative scenarios of reform (S-1 and S-2) present the lower grade of horizontal inequality when measured with respect to the overall redistributive effect (i.e. PH/RE), accounting for only 6.3 percent of the reduction of RE against the 9 and 7.60 percent of S-2018 and S-2012 respectively. Not surprisingly, this result is in line with the theoretical framework of tax design outlined in the previous chapters and points out how the larger distortion of the neutral nature of VAT - arising from a very fragmented structure of rates - does not only imply violations of the *fairness* of the taxation process but results in a loss of power of the redistributive effect that it originally aimed to achieve.

The results obtained through the Gini decomposition are substantially aligned to the ones presented for the MLD (see Table 3.5). Even in this case, the presence of the four VAT structures reduces the inequality of the pre-tax distribution where S-1 and S-2 are still the two systems that would achieve the higher level of redistribution. On the same line, S-1 and S-2 confirm to be the ones with a higher vertical redistributive power and the lower horizontal inequality associated to the presence of consumers' preferences. Finally, the two alternative scenarios also show lower relative levels of re-ranking of the population which - under the assumption that the

initial pre-tax distribution is assumed to be the redistributive benchmark of the policy maker - makes these two reform proposals preferable to the existing system.

Table 3.5. Gini decomposition of the overall redistributive effect of VAT reform scenarios for the Italian system (2012)

VAT scenarios	G^b	G^a	RE#	PV	PH	R	Ranking	*for MLD*
			absolute values				*via RE*	
S-2012	0.2848579	0.2818911	0.0029668	0.0035673	0.0003588	0.0002417	4	*4*
S-2018		0.2813161	0.0035418	0.0043086	0.0004221	0.0003447	3	*3*
S-1		0.2790542	0.0058037	0.0064891	0.0002867	0.0003987	1	*1*
S-2		0.2795491	0.0053088	0.0059638	0.0002976	0.0003574	2	*2*
VAT scenarios	**G^b**	**G^a**	**RE***	**PV**	**PH**	**R**	**PH/RE**	**R/RE**
			as percentage of J^b				*%*	*%*
S-2012	100	97.86	1.04	1.25	0.13	0.08	**12.09**	**8.15**
S-2018		97.45	1.24	1.51	0.15	0.12	**11.92**	**9.73**
S-1		95.93	**2.04**	2.28	0.10	0.14	4.94	6.87
S-2		96.30	**1.86**	2.09	0.10	0.13	5.61	6.73

Bandwidth = 35 €
No. classes = 225

where the overall redistributive effect of VAT is **$RE = G^b - G^a = PV - PH - R$**

G^b Gini inequality index of the before-tax distribution, which also measures the inequality of a uniform VAT scenario applied to the current distribution of pre-tax expenditures

G^a Gini inequality index of the after-tax distribution for different VAT structures

PV Vertical effect of VAT, computed as difference between Gb** and Ga**, which are obtained by replacing the individual expenditure values with the mean of the related "close-equals" subgroup

PH Horizontal inequity of VAT, equal to the difference between Gb* and Ga* computed within each group of "close-equals". PH can also be obtained as a residual term, as **PH=PV-R-RE**

R Re-ranking effect, computed as the Plotnick-Atkinson index where **$R = G^a - C^a$**

3.4. Normative analysis

Contrarily to the income tax framework, the normative interpretation of horizontal inequality for the case of indirect taxes is not clearly assessed, as this arises from the presence of arbitrary tastes and needs of consumption that are not specifically accountable in the design of VAT. However, even under the assumption that horizontal inequality is an implicit consequence of any differentiated VAT system[50], it is possible to argue that different structures of VAT rates may generate different grades of distortion and, thus, imply a diverse grade of loss of redistributive power to the tax system.

[50] And of any form of indirect taxation.

Under this premise, the analysis attempts to investigate the determinants of the presence of horizontal inequality given the composition of households' expenditure[51]. More specifically, the aim is to explore whether horizontal inequality arises from the presence of specific needs (associated to arbitrary characteristics and not significantly depending on consumption pure preferences), or if instead the component of individual tastes plays a significant role in the loss of vertical power of the current VAT structure. If that would be the case, the evidence found previously would make the two-rate VAT structure much preferable than the existing one, as the former would manage to better reduce the impact of pure unpredictable tastes on the overall redistributive effect of the tax.

Following the work of Decoster et al. (1997), a basic OLS regression has been performed in order to explore which categories of expenditure could contribute to the presence of horizontal inequality. The model is expressed by a linear function *f*, where

$$y_i = f(x_i, needs, tastes)$$

and y_i= equivalent expenditure after VAT for each simulation scenario *i*;
x_i= equivalent expenditure after a uniform VAT for each simulation scenario *i*;
i= (S-2012, S-2018, S-1, S-2) and *needs* and *tastes* are covariates.

As horizontal inequality is measured in terms of the distortion in the tax treatment with respect to the true tax liability of taxpayers, the contribution of tastes and needs can be measured residually from the comparison between the after tax distribution of expenditure for each of the VAT structures considered and the equivalent after tax distribution in the case of a uniform scenario. This is because in a uniform rate scenario VAT preserves its original property of neutrality, and the presence of individual tastes and needs do not generate differential tax treatments across "equals" taxpayers.

The results are presented in Table 3.6. First, it can be noted that the regression coefficient of the uniform VAT system is close to one for each of the scenarios under analysis. In particular, this coefficient is slightly lower for S-1 and S-2 and, with the presence of a larger intercept coefficient, it confirms the fact that the two-rate VAT systems present a higher redistributive power.

However, there are other variables of this model that play a significant role in explaining some of the horizontal variation across the post-tax expenditure values. For the case of expenditure related to needs, it is possible to see how the presence of disability and health expenditure

[51] Ideally, this type of analysis should be based on individuals' consumption patterns but, due to the absence of consumption data, expenditure levels are used as a proxy of households' endowments (Decoster et al., 1997).

within the household contributes to the overall level of horizontal inequality. More importantly, all the four VAT structures presented seem to be positively contributing (in terms of post-tax expenditure) for differences in disability and health needs, especially for the case of S-1 and S-2 that present the largest coefficients.

Alongside, the model also shows the significance of categories of expenditure largely related to pure tastes in consumption. In particular the presence of a second house, even if marginal in the whole sample (only 8.6 percent of the households declares to have a second house), result to improve the after tax expenditure with respect to a neutral scenario. In the case of expenditure for vacation, the proposed two rate VAT scenarios seem instead to reduce the expenditure after tax contrarily to the current system. This can be easily explained by the fact that the intermediate VAT rate abolished in S-1 and S-2 largely refers to the touristic sector. Finally, the large presence of smokers or vehicles in the household contributes significantly to horizontal inequality and acts to reduce the after tax expenditure of tax payers. In redistributive terms this may be considered a favourable discriminating effect of the system (especially in the case of smoking), especially when compared to the positive treatment for special needs. Finally, the choice (or need) of renting a house seems to penalise households and this difference in VAT treatments provides a significant contribute to horizontal inequality.

Note how the significance of some family types in the model may in part reflect the failure of the equivalence scale adopted in correcting household expenditures into equivalent values (Decoster et al., 1997). However, it is not possible to exclude that some of these household categories, as the one with presence of children, may follow different patterns of consumptions than the others, and that this factor could contribute considerably to the overall horizontal inequality of the system. This is confirmed by the negative coefficient associated to the presence of pre-scholar and scholar children in the house. In other words, it seems that the presence of children in pre-scholar or scholar age is more horizontally “inequitable” in terms of VAT paid that in the case of households with no children, and generally acts to worsen the after-tax distribution of families with children.

Table 3.6. OLS regression of after-tax equivalent expenditure regarding the determinants* of horizontal inequality associated to the four VAT scenarios (Italy, 2012)

Variables (X)	Net Equivalent expenditure (Y)				% of yes
	S-2012	S-2018	S-1	S-2	
	absolute coeff. (standard errors)				
net equiv. expenditure in uniform scenario	1.087311***	1.104241***	1.088486***	1.078412***	
	(0.0019479)	(0.0023496)	(0.0019017)	(0.0018758)	
disability (d)	9.100059**	8.375374*	**28.34725*** **	**35.03888*** **	1,7%
	(3.487737)	(4.081431)	(4.198347)	(4.1037)	
prescholar (d)	-4.955333***	-5.906807***	-5.230486***	**-3.943935*** **	10,2%
	(0.8300535)	(0.9717923)	(0.9477002)	(0.9188552)	
scholar (d)	**-4.123303*** **	-4.806615***	-5.330572***	**-4.337172*** **	20,1%
	(0.709938)	(0.8346482)	(0.8143599)	(0.7950156)	
health exp. (d)	9.351899***	11.15566***	**16.38958*** **	**15.90357*** **	22,7%
	(0.9871526)	(1.156126)	(1.033144)	(1.010445)	
Household type					
single, no child and <65	8.609186***	10.31843***	6.872238***	6.430185***	15,8%
	(1.490859)	(1.749474)	(1.602304)	(1.637363)	
couple, no child and<65	1,208613	1,531436	-3.676691*	-3.774506*	8,5%
	(1.580112)	(1.859685)	(1.700854)	(1.740776)	
elderly, no child	9.80548***	11.56251***	16.81664***	13.73845***	27,2%
	(1.198561)	(1.410931)	(1.331066)	(1.379344)	
single or couple with child	-1,422878	-1,642265	-4.02216***	-3.263299**	42,9%
	(0.9852353)	(1.160272)	(1.113854)	(1.162761)	
rent (d)	-14.71278***	-16.08914***	**-9.375496*** **	**-7.605525*** **	16,9%
	(0.7972541)	(0.9335376)	(0.8658969)	(0.8499786)	
second house (d)	**42.13746*** **	**49.92357*** **	**49.79733*** **	**41.57296*** **	8,6%
	(2.052049)	(2.407469)	(2.138707)	(2.103073)	
smoker (d)	**-8.270131*** **	**-9.709715*** **	**-8.408563*** **	**-7.345861*** **	26,4%
	(0.7347737)	(0.862566)	(0.8099631)	(0.790782)	
vehicle (d)	-3.837571***	-4.340689***	**-13.48163*** **	**-12.46502*** **	80,0%
	(1.040545)	(1.217005)	(1.126342)	(1.095147)	
holiday (d)	14.93211***	15.92903***	**-37.222*** **	**-31.4554*** **	7,9%
	(2.168041)	(2.540538)	(2.109455)	(2.059515)	
constant	30.85487***	35.73569***	49.40084***	45.46839***	
	(1.897354)	(2.220115)	(1.976626)	(1.966306)	
No. of observations	22'993	22'993	22'993	22'993	
Population	25'383'757	25'383'757	25'383'757	25'383'757	
MSE	44.392	51.925	47.786	46.572	
R^2	0.9976	0.9966	0.997	0.9972	

*Some variables (as for instance type of vehicle, other durables goods, age and education of the head of the household) have been excluded from the final regression, as not providing any further significant contribution to the explanation of the horizontal inequality measured. Due to the way these values are collected in the survey, education and childcare expenditure have been approximated by the presence of scholar and pre-scholar members in the household respectively.

Overall, this simple regression analysis shows the significance of some typologies of expenditure in explaining the horizontal distortion of the tax treatment found in the decomposition analysis. This ultimately confirms the presence of horizontal inequality arising from the presence of tastes and needs. However, it is possible to notice how the presence of measurable needs is generally accounted by the design of VAT, apart from the case of education

and childcare expenditure where the presence of scholar and pre-scholar children may indicate a negative discrimination. On the other side, the significant influence of individual tastes to the overall horizontal effect of both VAT structure raises the question on whether the order of the horizontal effect found in the simulation scenarios is associated to specific needs incorporated (or not) in the VAT design or, instead, mainly accountable to pure unpredictable tastes of consumption. This is an important point, as the real progressivity of VAT should firstly be targeting the part of the household's endowment which is somehow "rigid", in the sense that is not arising by the presence of pure differences in tastes (Decoster et al., 2010). In this sense, measuring horizontal inequality on the component of expenditures associated to individual preferences of consumption can help exploring which of the VAT scenarios presented would maximise the overall redistributive power of the structure of rates.

For this reason, the MLD analysis has been replicated for the distribution of expenditure net of the particular needs identified in the OLS regression. In particular, the expenditure in health, childcare, education and disability has been excluded from the distribution prior tax and households have been newly grouped on the basis of the same monetary interval of 35 euro (see Table 3.7).

Interestingly, the decomposition obtained by excluding the share of expenditure associated to specific needs presents very similar results to the one reported in Table 3.4. Furthermore, the grade of horizontal inequality found in all four scenarios results slightly lower than the ones obtained for the whole distribution of expenditure. This first shows how there may be some room for improving the way special needs are accounted by the VAT rates but, on the other side, it is indeed true that some of these objectives might be better targeted through alternative tax means, like in-kind transfers. Second, the decomposition highlights the significant contribution of "pure" tastes of consumption to the loss of vertical power of the current three rate VAT system. More importantly, the presence of needs does not seem to affect the directions of reform found for the whole distribution of expenditure. This supports the evidence presented previously regarding the opportunity to shift towards a more efficient two-rate VAT system while achieving a better redistributive outcome.

Table 3.7. MLD decomposition of the overall redistributive effect of VAT reform scenarios for the Italian system (2012) in absence of needs

VAT scenarios	J^b	J^a	RE#	PV	PH	Ranking	*for whole exp.*
			absolute values			*via RE*	
S-2012	0.1340096	0.1305990	0.0034106	0.0036428	0.0002323	4	4
S-2018		0.1299322	0.0040774	0.0044074	0.0003300	3	3
S-1		0.1276524	0.0063572	0.0067091	0.0003520	1	1
S-2		0.1281829	0.0058267	0.0061435	0.0003168	2	2
VAT scenarios	**J^b**	**J^a**	**RE***	**PV**	**PH**	**PH/RE**	***for MLD (all)***
			as percentage of J^b			*%*	
S-2012	100	97.45	2.55	2.72	0.17	6.81	**7.60**
S-2018		96.96	3.04	3.29	0.25	8.09	**9.06**
S-1		95.26	4.74	5.01	0.26	5.54	6.34
S-2		95.65	4.35	4.58	0.24	5.44	6.36

Bandwidth = 35 €
No. classes = 225

where the overall redistributive effect of VAT is **RE = J^b - J^a = PV - PH**

J^b MLD inequality index of the before-tax distribution, which also measures the inequality of a uniform VAT scenario applied to the current distribution

J^a MLD inequality index of the after-tax distribution for different VAT structures

PV Vertical effect of VAT, computed as difference between Jb** and Ja**, which are obtained by replacing the individual expenditure values with the mean of the related "close-equals" subgroup

PH Horizontal inequity of VAT, computed as difference between Jb* and Ja* within each group of "close-equals". These two indexes capture the "dispersion" around the average of individual net expenditures

3.5. Robustness analysis

In order to test the sensitivity of the results obtained, the decomposition analysis has been replicated for different values of the parameters, finding how the results presented are stable to changes of the bandwidth, equivalence scale and depreciation schedule for durable goods.

As it is possible to note from Table 3.8, the size of the bandwidth chosen (35€) does not seem to affect the robustness of the results obtained through the MLD decomposition. More specifically, any bandwidth between 5 and 55 euro produces similar results, as the vertical power and the contribution of horizontal inequality remain of the same order among the four VAT scenarios. This confirms the higher redistributive impact found for S-1 and S-2 and the lower impact of horizontal inequality on the overall redistributive effect with respect to the three rate VAT structures.

As argued by Ven et al. (1998), the optimal bandwidth for sampled data is the one that maximises the vertical effect obtained by the decomposition. In this sense, the bandwidths of 35 and 40 euros seem to be the ones that capture the larger vertical effect in terms of J^b. As the two intervals are very close, the analysis adopts the one of 35 euros as being the smaller one. In this sense, it is important to remark how positive values of horizontal inequality are found even for very small intervals of equivalent monetary expenditure (e.g. 5€). Finally, an interval of 555 euros set the upper bound threshold of the decomposition analysis, as horizontal inequality becomes negative by capturing the redistributive impact of the vertical effect within the subgroup.

Finally the MLD decomposition has been tested for a different equivalence scale (the OECD modified scale[52]) and for the presence of a depreciation schedule for durable goods. Table 3.9 shows the result obtained for a bandwidth of "close-equals" of 35 euros. From the comparison with the main results, the use of the modified OECD scale slightly increases the impact of the horizontal effect, but does not change the scenario and the directions of reform found with the use of the squared root of the family size. In the case of durable goods, the absence of a depreciation schedule produces different values for the horizontal and vertical component. However, the impact of the horizontal effect of the two alternative simulation scenarios is still inferior than S-2018, while S-2 results lower than S-2012 too. In addition, S-1 and S-2 still present higher vertical impact than the three VAT structures, confirming how the two-rate VAT systems proposed would represent a better alternative in both redistributive and revenue efficiency terms independently of the choice and values of the identification criteria employed.

[52] The OECD modified scale assigns a coefficient of 1 to the household head, 0.5 to any additional adult and 0.3 to each child (defined as a member of the household under 14 years old).

Table 3.8. Decomposition of the redistributive effect through MLD for VAT scenarios and different bandwidth of "close-equals" (Italy, 2012)

Band width	Subgroups	Current scenario in 2012						
		J^b	J^a	RE	PV	PH	PH/RE	PV/J^b
5 €	1062	0.13583	0.13293	0.00290	0.00311	0.00021	7.07%	2.288%
15 €	446	0.13583	0.13293	0.00290	0.00312	0.00022	7.41%	2.295%
25 €	295	0.13583	0.13293	0.00290	0.00312	0.00022	7.50%	2.297%
35 €	**225**	**0.13583**	**0.13293**	**0.00290**	**0.00312**	**0.00022**	**7.60%**	**2.299%**
40 €	203	0.13583	0.13293	0.00290	0.00312	0.00022	7.55%	2.298%
45 €	185	0.13583	0.13293	0.00290	0.00312	0.00022	7.53%	2.298%
55 €	158	0.13583	0.13293	0.00290	0.00312	0.00022	7.54%	2.298%
255 €	47	0.13583	0.13293	0.00290	0.00309	0.00019	6.51%	2.276%
555 €	27	0.13583	0.13293	0.00290	0.00289	-0.00001	-0.50%	2.126%
Band width	**Subgroups**	**Legal provisions for 2018**						
			J^a	RE	PV	PH	PH/RE	PV/J^b
5 €	1062	-	0.13236	0.00347	0.00376	0.00029	8.43%	2.767%
15 €	446	-	0.13236	0.00347	0.00377	0.00031	8.84%	2.777%
25 €	295	-	0.13236	0.00347	0.00378	0.00031	8.94%	2.780%
35 €	**225**	**-**	**0.13236**	**0.00347**	**0.00378**	**0.00031**	**9.06%**	**2.783%**
40 €	203	-	0.13236	0.00347	0.00378	0.00031	9.01%	2.782%
45 €	185	-	0.13236	0.00347	0.00378	0.00031	8.99%	2.781%
55 €	158	-	0.13236	0.00347	0.00378	0.00031	9.00%	2.781%
255 €	47	-	0.13236	0.00347	0.00374	0.00028	7.97%	2.755%
555 €	27	-	0.13236	0.00347	0.00350	0.00003	0.85%	2.573%
Band width	**Subgroups**	**Simulation 1**						
			J^a	RE	PV	PH	PH/RE	PV/J^b
5 €	1062	-	0.13030	**0.00553**	0.00587	0.00033	5.99%	4.3183%
15 €	446	-	0.13030	0.00553	0.00588	0.00035	6.29%	4.3304%
25 €	295	-	0.13030	0.00553	0.00589	0.00035	6.35%	4.3327%
35 €	**225**	**-**	**0.13030**	**0.00553**	**0.00588**	**0.00035**	**6.34%**	**4.3326%**
40 €	203	-	0.13030	0.00553	0.00589	0.00035	6.39%	4.3347%
45 €	185	-	0.13030	0.00553	0.00589	0.00035	6.40%	**4.3350%**
55 €	158	-	0.13030	0.00553	0.00589	0.00035	6.36%	4.3332%
255 €	47	-	0.13030	0.00553	0.00585	0.00031	5.68%	4.3054%
555 €	27	-	0.13030	0.00553	0.00552	-0.00002	-0.31%	4.0614%
Band width	**Subgroups**	**Simulation 2**						
			J^a	RE	PV	PH	PH/RE	PV/J^b
5 €	1062	-	0.13081	0.00502	0.00532	0.00030	6.00%	3.9178%
15 €	446	-	0.13081	0.00502	0.00534	0.00032	6.30%	3.9288%
25 €	295	-	0.13081	0.00502	0.00534	0.00032	6.34%	3.9303%
35 €	**225**	**-**	**0.13081**	**0.00502**	**0.00534**	**0.00032**	**6.36%**	**3.9311%**
40 €	203	-	0.13081	0.00502	0.00534	0.00032	6.42%	3.9331%
45 €	185	-	0.13081	0.00502	0.00534	0.00032	6.43%	**3.9334%**
55 €	158	-	0.13081	0.00502	0.00534	0.00032	6.38%	3.9316%
255 €	47	-	0.13081	0.00502	0.00531	0.00029	5.70%	3.9065%
555 €	27	-	0.13081	0.00502	0.00504	0.00002	0.32%	3.7077%

Table 3.9. Decomposition of the redistributive effect through MLD for VAT scenarios with different equivalence scale and no depreciation schedule (Italy, 2012)

Bandwidth=35€	**J^b**	**J^a**	**RE**	**PV**	**PH**	**PH/RE**	**PV/J^b**
OECD Squared Root and depreciation schedule (main results)							
S-2012	0,13583	0,13293	0,00290	0,00312	0,00022	7,60%	**2,30%**
S-2018		0,13236	0,00347	0,00378	0,00031	9,06%	**2,78%**
S-1		0,13030	0,00553	0,00588	0,00035	**6,34%**	4,33%
S-2		0,13081	0,00502	0,00534	0,00032	**6,36%**	3,93%
No. groups 225							
OECD Modified Scale and depreciation schedule							
S-2012	0,142221	0,139427	0,002794	0,003016	0,000222	7,95%	**2,12%**
S-2018		0,138887	0,003334	0,003651	0,000317	9,50%	**2,57%**
S-1		0,136965	0,005256	0,005619	0,000363	**6,91%**	3,95%
S-2		0,137426	0,004795	0,005124	0,000329	**6,87%**	3,60%
No. groups 217							
OECD Squared Root and no depreciation schedule							
S-2012	0,16062	0,15503	0,00559	0,00583	0,00023	4,13%	**3,63%**
S-2018		0,15397	0,00665	0,00698	0,00033	4,94%	**4,34%**
S-1		0,15316	0,00746	0,00783	0,00036	**4,83%**	4,87%
S-2		0,15247	0,00815	0,00848	0,00033	**4,02%**	5,28%
No. groups 281							

Conclusions

A structure of differentiated VAT rates has been historically adopted with the aim of mitigating the regressive impact of VAT on low-income households whilst ensuring a stable source of fiscal revenue arising from final consumption of taxpayers. In the past decade, VAT has been progressively used in many European countries to gather an ever growing need for fiscal resources, in a context of extremely rigid government expenditure and low growth. This process has led to a widespread increase of the standard VAT rates across Europe and has ultimately broaden the gap in terms of fiscal treatment between selected typologies of consumption - considered eligible of a more favourable VAT treatment - and the remaining set of expenditures. In this sense, a number of studies (Cnossen, 2002; Crossley et al., 2009; Boeters et al., 2010; Crawford et al., 2010; Lejeune, 2011; Mirrlees et al., 2011) has questioned whether the existing multi-rate VAT structures would effectively provide the best fiscal alternative in both terms of revenue-efficiency and redistribution. Not less importantly, these findings support the idea that a shift towards indirect taxation may increase the overall progressivity of a tax system, if the higher resources obtained through indirect taxes are employed to better target the progressivity of the existing forms of *direct* taxation (OECD, 2007; Lejeune, 2011; Bernardi, 2013).

From a tax design perspective, a uniform VAT rate structure embodies a number of desirable properties in terms of revenue collection, neutrality in consumption choices, transparency, accountability, non-compliance and administrative costs. On the other side, the diversification of the VAT treatment (i.e. the applicability of different tax rates) reflects a set of redistributive concerns based on specific characteristics of the goods and services destined to final consumption. This arises from the fact that patterns of consumption are not directly revealing the true tax capability of taxpayers, and that VAT is ultimately an "indirect" mean of redistribution (Boeters et al., 2010). In the end, this explains why some typologies of consumption that tend to impact heavily on the overall expenditure of low-income families have generally been considered eligible of a favourable VAT treatment. Eventually, this choice incorporates the economic principle that commodities with relatively inelastic demands should be considered "necessity" goods and therefore their final consumption should be liable of a reduced VAT regime (Boeters et al., 2010). Alongside, the presence of positive externalities arising from the consumption of specific categories of "merit" goods reflects the aim to stimulate higher levels of these expenditures and thus to improve the aggregate social welfare.

However, consumers' choices are ultimately driven by an underlying distribution of individual preferences, which is not accountable in the original design of VAT. In a system of highly

differentiated VAT rates, this may imply that individuals with different tastes and needs may be subject to a different tax treatment even if they account for similar levels of expenditure. In methodological terms, this means that traditional analysis of tax incidence may fail to capture the effective redistributive implications of a VAT structure. Contrarily to the case of direct taxes, the redistributive impact of VAT cannot be evaluated on immediate measures of the ability to contribute of taxpayers, as final consumptions depends also on arbitrary individual preferences[53]. If preferences and needs would be homogenous across consumers, the redistributive impact of a differentiated VAT structure would be maximised, as no distortion in the VAT treatment would arise from differences in individual tastes. As this is not the case in a real context of tax reform, the work makes use of a methodology originally developed by Aronson et al. (1994) and Lambert and Ramos (1995; 1997a), which allows to disentangle the "vertical" redistributive effect of the multi-rate VAT structure from the "horizontal" inequity arising from differences in tastes and needs. In order to capture the horizontal discrimination in the tax treatment, the concept of horizontal inequity has been analysed in terms of the variation of the inequality between the pre- and post-tax distribution of expenditures. Taxpayers considered eligible of the same VAT treatment have been identified based on their levels of pre-tax equivalent expenditure and consequently grouped in small bands, defining groups of "close-equals". This criterion of identification of horizontal inequality reflects the idea that pre-tax monetary expenditure provides a relatively reliable proxy of the household's endowment when information on families' consumption choices is not available (Decoster et al., 1997). However, given similar levels of expenditure, the composition of consumption may significantly vary in presence of special individual needs, as for instance disability. In this case, "close" individuals in terms of expenditure levels should not be regarded as eligible of the same VAT treatment as beside these specific categories of needs are generally subject to a reduced or exempted VAT regime. Following these considerations, the analysis of horizontal inequality has been replicated excluding all those (observable) categories of expenditures that benefit of a reduced VAT regime because of particular needs of individuals. In this way, the horizontal inequality arising from this restricted distribution would be mainly accountable to the presences of pure tastes and preferences of consumption.

It is important to highlight how, in the case of indirect taxes, this approach of horizontal inequality has been preferred to more traditional models of consumption choice, as it avoids stating any assumptions on the behaviour of consumers[54] and thus allows measuring the

[53] It is indeed true that preferences of consumption are likely to vary under different VAT scenarios. However, this effect is not accountable in the analysis, as it would require some prior knowledge of the individual patterns of consumption, which ultimately contrasts with the driving hypothesis of unpredictability of consumers' preferences.
[54] As for instance the assumption of separability and homogeneity of consumption choices which is adopted, with different degrees of flexibility, in most CGE models (see Bye et al., 2011).

potential loss of redistributive power arising from unobservable characteristics of consumers. This methodological choice is associated to an evaluation scenario where the overall levels of pre-tax expenditure are invariant to changes in final and production prices caused by the modification of the VAT rates. The assumption of constant expenditure incorporates the idea that budget shares provide to be an important source of information of the heterogeneity of the underlying consumption patterns (Creedy, 1999), even when it is not possible to estimate the variation in the composition of expenditures. As outlined previously, this methodology has been preferred in order to avoid any necessary restriction on consumers' behaviour that would have otherwise reduced the focus of the research. Finally, this approach also reflects the consideration that annual expenditures represent a better proxy of households' lifetime resources as opposed to annual income, where the latter also results in biased measures of the redistributive impact of VAT (Mirrlees, 2011; Arsic and Altiparmakov, 2013). That is, as the propensity to save increases with income, VAT will always result more regressive when measured with respect to this tax base. On the contrary, the most relevant limitation of this approach is that it lacks the ability to provide a more general evaluation of the potential gain in terms of overall progressivity of the tax system that could arise from the shift of resources from direct to indirect taxation[55].

This theoretical and methodological framework has been investigated empirically for the case of the Italian VAT system. More specifically, Italy currently relies on a three-rate VAT structure, characterised by a strong fragmentation of legal rates and a scarce homogeneity among categories of expenditures liable of a reduced or exempted regime. Under the recent trend of progressive increases of VAT rates experienced from 2010 and the constraints in terms of fiscal revenue and government budget, the Italian system represents an ideal scenario to explore the effective redistributive potential of a strongly differentiated VAT system in the current European framework. In this context, the analysis compares the existing three-rate VAT structure in 2012 and 2018[56], with an alternative two-rate system where the existing intermediate rate of 10 percent is abolished and fewer but more homogenous categories of expenditure are eligible of a reduced VAT regime.

Briefly, the empirical analysis has employed a micro-simulation model framed on the legal Italian VAT structure for 2012 and based on monthly household expenditure micro-data from the latest wave of the national Household Expenditure Survey (HES). In order to provide a

[55] This limitation is strengthen by the difficulties to obtain reliable income-expenditure data from the Italian case, which is the focus of the present research. Recent works (Tedeschi and Pisano, 2013; Gastaldi et al., 2014) who make use of linked income and expenditure data for Italy show the difficulties in matching households in the lowest tail of the distribution, where positive values of expenditure are associated to null income values. For this reason, the use of these linked data has been precluded from the present analysis.

[56] As prescribed by the recent government provisions in terms of budget stability for 2015-2018.

realistic picture of the impact of VAT, expenditures on durable goods and housing have been revised through a depreciation schedule. Then, VAT rates have been assigned to the micro-categories of expenditures recorded by the survey through a weighting procedure, as in some cases different legal rates apply within the same classification. At this purpose, the weights of the corresponding Consumer Price Index survey have been used to compute average VAT rates when no perfect match of the categories was available. This procedure allows the computation of the amount of VAT paid by each family in the sample at a much disaggregated level of expenditure, which ultimately enables the analysis to better capture the information resulting from the transition from a multi-rate scenario to a more uniform one.

The results obtained through the decomposition of the overall redistributive effect of VAT show how the two-rate systems proposed would not only have a higher redistributive power but would also account for a lower presence of horizontal inequality. All the four VAT scenarios under analysis improve the progressivity of the system as they reduce the overall inequality level of the post-tax distribution, providing evidence on how the currently adopted VAT structure achieves some degree of redistribution. However, the more homogenous structure of the two-rate VAT generates a higher vertical effect when compared to the existing one whilst simultaneously guaranteeing the same increase of revenue anticipated for 2018. This shows how the widespread use of differential rates does not represent the most efficient solution in the Italian case, casting further doubts on the effective economic rationale behind the current structure. More significantly, the presence of lower levels of horizontal inequality and re-ranking effect within the two alternative scenarios corroborates the initial hypothesis that the heterogeneity of individual preferences reduces the redistributive power of a too highly fragmented VAT structure. The same result is obtained when excluding specific individual needs from the overall pre-tax expenditure distribution, providing evidence on how the presence of a significant horizontal discrimination of VAT is in a large extent accountable to pure arbitrary individual tastes that are out of the scope of VAT design.

Independently of the normative significance of horizontal inequality in a context of indirect taxes - where different tax treatments may arise for the presence of completely arbitrary tastes and needs – the analysis confirms for the Italian case the doubts expressed by several authors (Patrizii and Rossi, 1988-1993; Gastaldi and Liberati, 1998; Liberati, 2001; Gastaldi et al., 2014) on the efficiency to address redistributive goals through a very differentiated system of VAT rates. Not less importantly, these results highlight how the “abuse” of an excessively fragmented rates structure fails its original objective to mitigate efficiently the regressivity of VAT, supporting the thesis of relying on more appropriate forms of (direct) taxation for achieving better redistribution within the whole tax system. Finally, the work strengthens some prior

evidence for the Italian case (Patrizii and Rossi, 1988-1993; Gastaldi and Liberati, 1998; Liberati, 2001; Gastaldi et al., 2014) on the convenience of migrating towards a more uniform VAT rate system in both terms of revenue efficiency and redistributive effectiveness.

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