

THE REDISTRIBUTIVE EFFECTS OF VAT IN PORTUGAL*

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“Em matéria de taxas, não foi possível adoptar a solução que, nos dias de hoje, vem merecendo, e com justas razões, uma clara preferência no plano estritamente técnico. É com efeito assente que, nesta matéria, os impostos gerais de transacções muito têm a ganhar e pouco a perder, com uma estrutura de taxas o mais simples possível – no limite com uma taxa única. Evitam-se assim não poucos problemas administrativos.”

VAT Code preamble, 1986

“If an income tax is well designed, adding differential commodity taxation is likely to increase the ability to redistribute income little, if at all”.

Stiglitz J., Economics of the Public Sector, 2000

1. INTRODUCTION

In economic terms, State intervention in a market economy may be made on a multitude of grounds. Overall, these may be related to efficiency or equity goals. Given a specific system of social preferences, its pursuance implies trade-offs that have to be carefully taken into account in the design of public policies.

State actions aimed at promoting equity may use a large number of instruments, with different costs in terms of efficiency and different effectiveness concerning redistribution. As a consequence, it is advisable to follow an overall approach, choosing a policy mix well suited for income redistribution, both on the revenue and expenditure sides.

Economic theory and the requirements for a good tax system suggest that taxation on consumption should not comprise several rates set down on the basis of redistributive concerns, given their sizeable efficiency and tax administration costs. However, Value Added Tax (VAT), which is the main tax on consumption in European Union Member-states and several other industrialized countries, has in most cases multiple rates, basically defined with the aim of ensuring that the tax is progressive, or at least not regressive.

* The opinions expressed in the article are those of the authors and do not necessarily coincide with those of Banco de Portugal or the Eurosystem. Any errors and omissions are the sole responsibility of the authors.

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The objective of this paper is to analyse the impact of VAT in Portugal, in terms of redistribution. Section 2 briefly presents the main aspects of its introduction, working and receipt developments with a particular emphasis on the recent period. Section 3 analyses consumers' patterns of expenditure subject to VAT, by classes of goods and services, using the data compiled in the context of the 2005-2006 Household Expenditure Survey (HES). On the basis of the same information, Section 4 classifies VAT in Portugal according to its effects on the distribution of expenditure and income. In Section 5, the distributive impact of this tax *vis-à-vis* expenditure is broken down into its vertical, horizontal and reranking components. The conclusion is provided in Section 6.

2. VAT IN PORTUGAL

VAT was introduced in Portugal in 1986, in the context of the reform of taxation on goods and services. This change occurred before it was required by the conditions of Portugal's membership of the European Community. VAT, as prescribed by European directives, is a general tax on the consumption of goods and services, applied at each stage of production, whose legal incidence is on final consumers. Economic incidence, however, is split between producers and consumers, according to market conditions. Exports are not subject to VAT, as they are only taxed in the country of destination.¹ Imports are taxed on their overall amount. VAT replaced the Tax on Transactions and several other indirect taxes, and its introduction made it possible to achieve an increase in receipts by broadening the tax base and reducing tax fraud and evasion. The VAT code initially established four rates: 0 per cent, 8 per cent (reduced rate), 16 per cent (standard rate) and 30 per cent (increased rate). Additionally, several goods and services, such as medical services, were tax exempt. The decision not to adopt a single rate was to prevent the reform from having a regressive impact on income distribution. VAT rates have been changed several times since the introduction of the tax,² mainly to increase receipts, implement decisions at the European level and improve the competitiveness of several specific sectors. Presently, there are only three rates: the 5 per cent reduced rate, the 12 per cent intermediate rate and the 20 per cent standard rate. Over the last few years the standard rate was increased from 17 to 19 per cent (in mid 2002) and to 21 per cent (in mid 2005), in both cases in the context of fiscal programmes aimed at reducing the general government deficit. Only recently, in mid 2008, was the standard rate reduced to the current level.

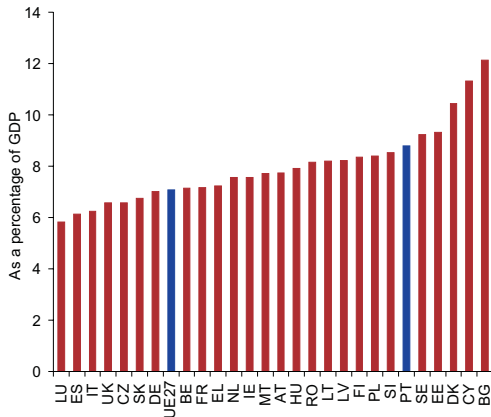
As in the remaining European Union Member-states, VAT in Portugal is one of the main sources of revenue. As illustrated in Chart 1, in 2007, Portugal had the sixth highest ratio of VAT receipts to GDP in the context of the Union. This outcome has been highly influenced by the high ratio of private consumption to GDP and also by the fact that the standard rate exceeds the European Union average (Chart 2). Chart 3 shows the evolution of VAT receipts from 1986 to 2008, as a ratio of both GDP and

(1) The definitive VAT regime in the European Union, to come into force on a date not yet established, is likely to rely on the origin principle.

(2) For a detailed description of changes to VAT rates from 1986 to 2002, see Rodrigues *et al.* (2002).

Chart 1

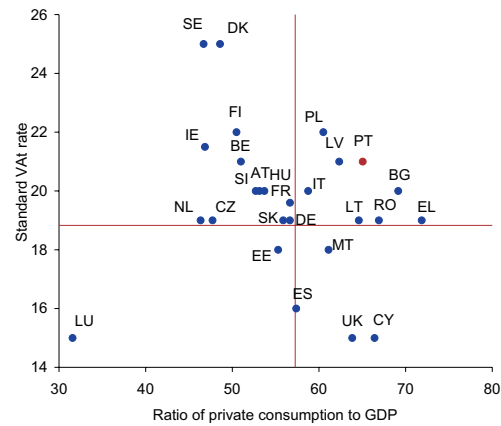
VAT RECEIPTS IN THE EU
2007



Source: European Commission (2009).

Chart 2

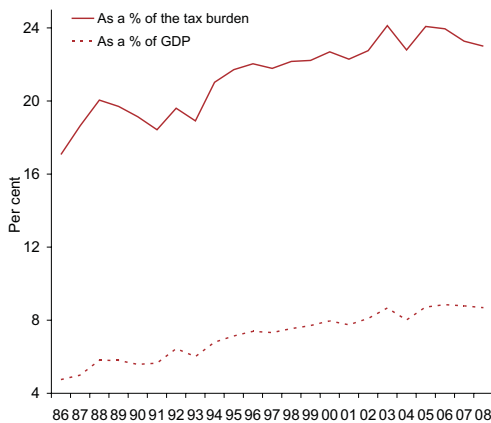
STANDARD VAT RATE AND THE RATIO OF PRIVATE CONSUMPTION TO GDP IN THE EU
2007



Sources: European Commission (2009), Eurostat and authors' calculations.
Note: The lines represent the weighted averages for the EU as a whole.

Chart 3

VAT RECEIPTS IN PORTUGAL



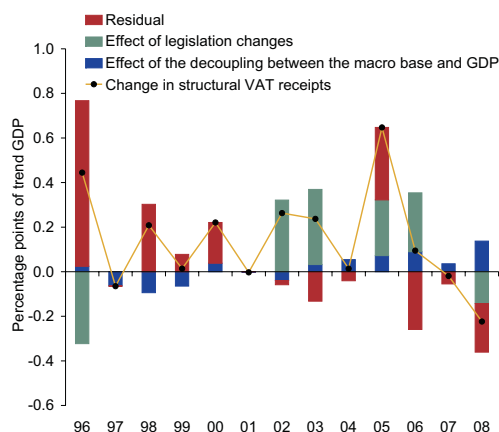
Sources: INE and authors' calculations.

the tax burden.³ The upward trend of VAT proceeds is clear and mainly derives from changes to the rates, several structural developments in course in the economy and the increased effectiveness of tax administration. Regarding structural developments in the economy, the long-term trend of consumption patterns towards a rise in the share of goods and services taxed at the standard rate and the growing importance of large and medium-sized firms, less averse to fulfilling their tax obligations, are worth

(3) The definition of tax burden consists of the sum of the receipts from taxes on income and wealth, taxes on production and imports (including the amounts that are revenue of the Community budget) and social contributions, as recorded in the National Accounts.

Chart 4

BREAKDOWN OF THE CHANGE IN STRUCTURAL VAT RECEIPTS



Sources: INE and authors' calculations.

Note: For more details on the methodology used to calculate these contributions, see Kremer *et al.* (2006) and Braz (2006).

mentioning. As shown in Chart 4, from 1996 to 2008⁴ the change in VAT structural tax revenue as a percentage of trend GDP not explained by changes to legislation and the discrepancy between the macroeconomic base (private consumption) and GDP developments was, in cumulative terms, positive.⁵

3. PATTERNS OF CONSUMPTION EXPENDITURE

The analysis of consumers' expenditure patterns set out in this paper is based on data compiled in the context of the 2005-2006 HES. This survey, implemented by the INE, covers a two-week period and aims at obtaining indicators on income distribution and the level and structure of expenditure of households resident in Portugal. It is a large scale survey, consisting of the records of all of the expenses of a sample of households over a two week period,⁶ which are used to estimate figures for the whole year. Complete and valid data were collected for 10403 households. Representativeness is firstly ensured by the choice of the sample followed by a definition of the weights to be used in the extrapolation of the results to the universe. These have always been used in the analysis presented in this paper.

Consumer choices, in terms of the allocation of overall expenditure to the various classes of goods and services, are a function of their preferences and income and relative prices. Information on prices is not included in the set of variables collected in these surveys. Chart 5 shows the relationship between

(4) The analysis did not cover the 1986-1995 period owing to difficulties in quantifying the effects of changes to legislation.

(5) It should be noted that the negative residuals in 2006 and 2008 partly stem from an acceleration of refunds resulting from changes to administrative procedures, whose impact on revenue is impossible to quantify from the information available.

(6) The two-week period for data collection was established for frequent household expenditure, such as food. In order to take into account the less frequent acquisition of several goods and services, other periods were defined: i) a month, for regular expenses, such as rents, water, electricity, gas and others; ii) two months, for goods and services such as clothing and footwear whose frequency of acquisition exceeds a month; iii) a year, for durable goods and services such as appliances, furniture and personal transportation vehicles acquired infrequently.

Chart 5 (to be continued)

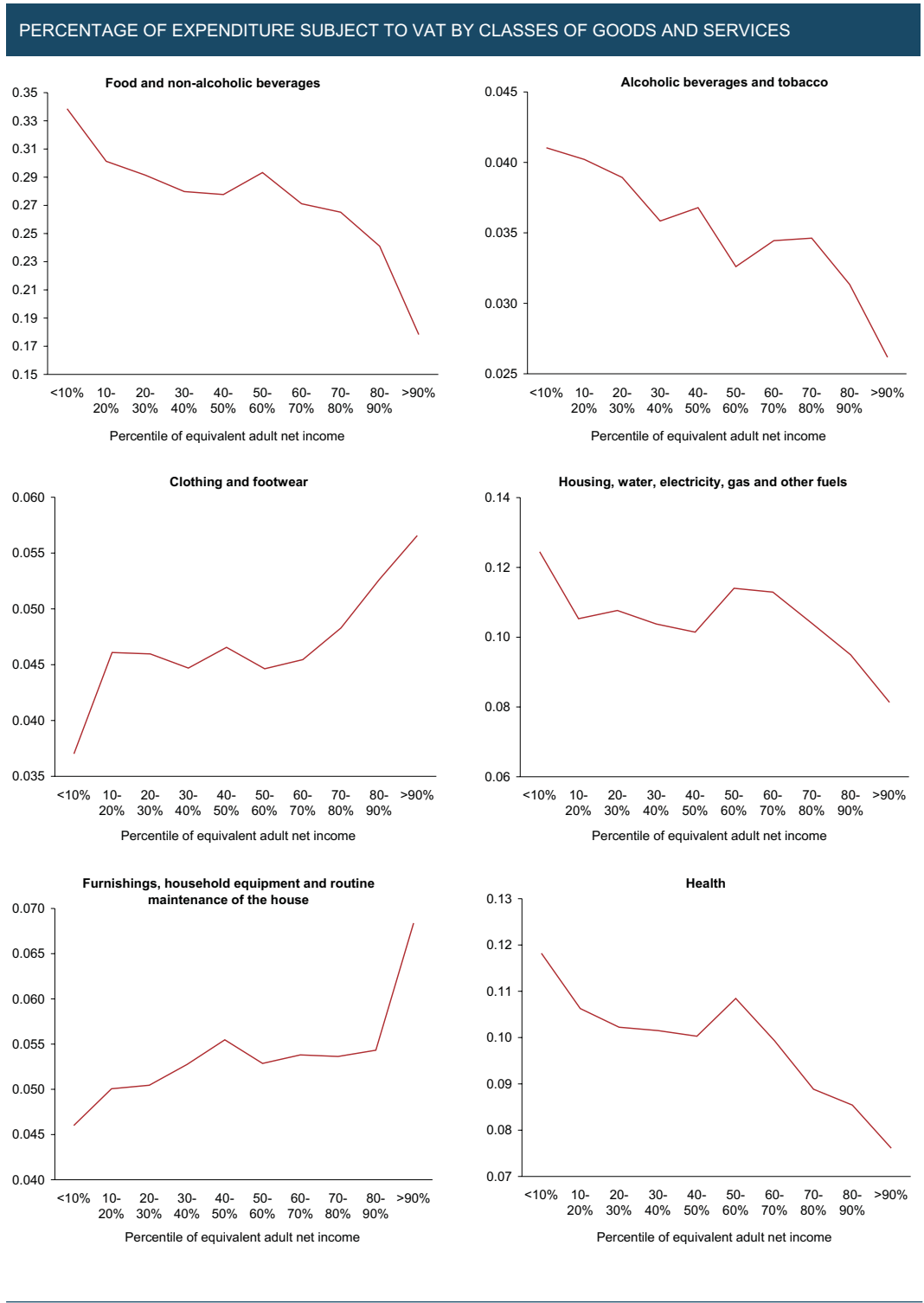
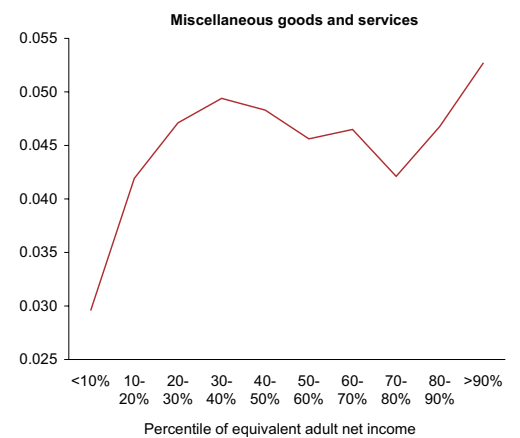
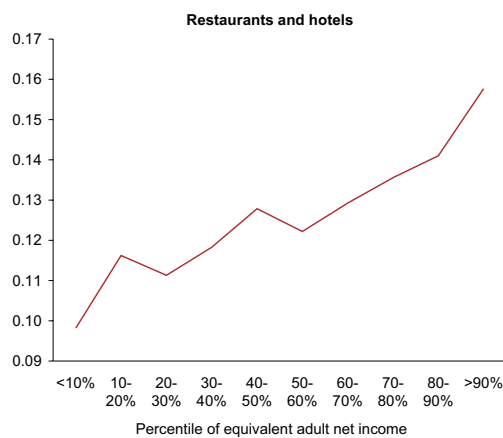
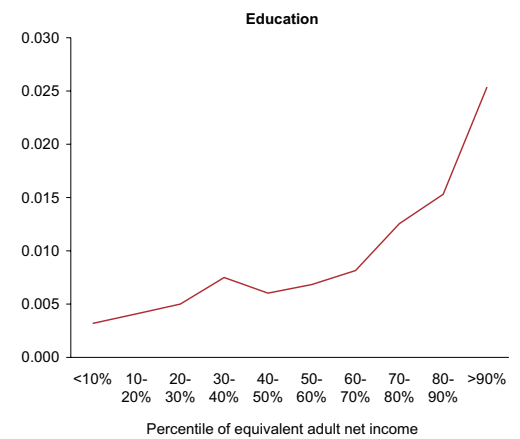
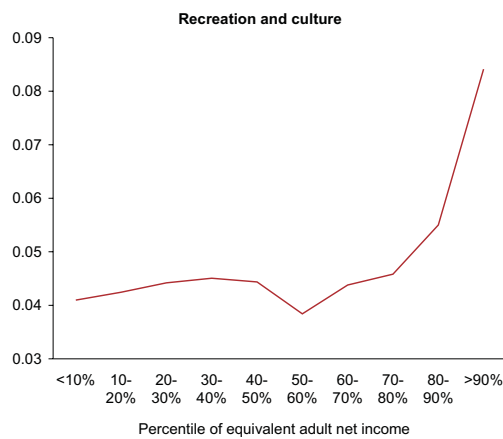
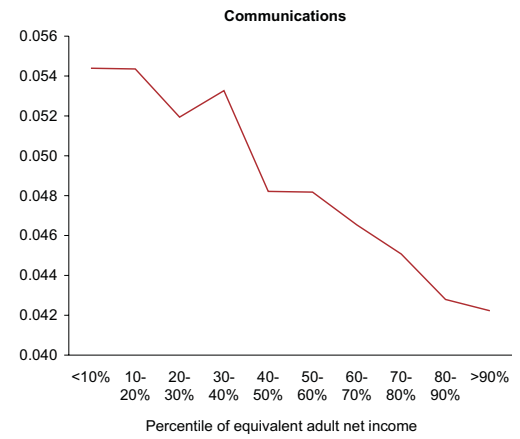
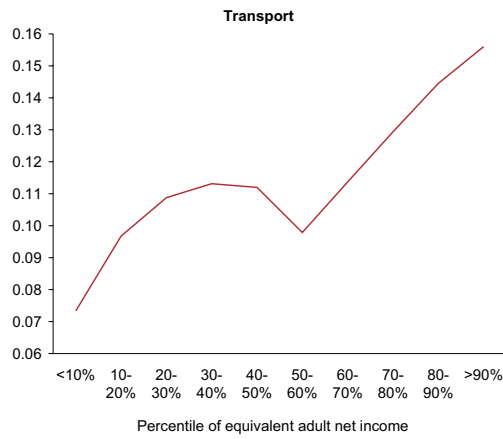


Chart 5 (continued)

PERCENTAGE OF EXPENDITURE SUBJECT TO VAT BY CLASSES OF GOODS AND SERVICES



Sources: INE and authors' calculations.

expenditure in several classes of goods and services (as a share of overall expenditure), and adult equivalent net income according to the HES information.⁷ Bearing in mind that the objective of this paper is to analyse the distributive effects of the current structure of VAT in Portugal, the definition of expenditure considered excludes several goods and services such as rents, financial services, insurance and gambling, which are not subject to VAT. The concept of net income includes households' gross monetary income from labour, property and capital and social and private transfers net of taxes on income and social contributions. The calculation of adult equivalent net income uses the OECD's equivalence scale, which attributes a weight of 1 to the first household member, 0.7 to the remaining adults and 0.5 to each child (defined in this case as being up to 14 years old).

According to the results obtained and in line with economic literature, the share of expenditure on food and non-alcoholic beverages declines with the level of net income. In 2005-2006, the households in the first income decile spent, on average, 34 per cent of overall expenditure on food and non-alcoholic beverages, while in the highest income decile this proportion decreases to 18 per cent. The same pattern is observed for other classes, ranked according to the ratio to overall expenditure: health; housing, water, electricity, gas and other fuels; communications; alcoholic beverages and tobacco. Regarding the remaining categories, for which the proportion to expenditure increases with net income (restaurants and hotels; transport; recreation and culture; furnishings, household equipment and routine maintenance of the house; clothing and footwear; education; and miscellaneous goods and services), it is important to highlight that, in spite of the said relationship, in several cases the goods and services are exempt from VAT or subject to the reduced or intermediate rates. Thus, it is possible to conclude that the definition of the lists of exemptions and goods and services subject to the different VAT rates did not stem exclusively from distributive objectives, but sometimes resulted from other considerations, such as the fact of being merit goods or services.

4. REDISTRIBUTIVE ASPECTS OF THE CURRENT STRUCTURE OF VAT IN PORTUGAL

The analysis of the redistributive effects of the current structure of VAT in Portugal is also based on detailed information on household expenditure included in the HES. In this context, each expenditure category was assigned to the respective VAT rate, with the exception of the items not subject to this tax, to which reference has already been made. It is important to highlight that in the calculation of consumers' expenditure, excluding VAT, it is implicitly assumed that the economic incidence of the tax corresponds to its legal incidence, i.e. that there is no repercussion effect. In most cases,⁸ the introduction of a tax on the consumption of a specific good generates a new equilibrium in the market, in which part of the tax burden is on producers, in a proportion which depends on the relative elasticities of demand and supply. This issue is not considered in the analysis set out in this paper. Four points are still worth

(7) The relationships shown approach the Engel curves defined in economic theory as relating consumers' optimal choices with the level of income, keeping prices unchanged. If the Engel curve has a positive (negative) slope the goods will be called normal (inferior). Normal goods may be classified as necessary goods, if the demand rises by a lesser proportion than income, and as luxury goods, in the opposite case.

(8) With the exception of the cases where the demand curve is perfectly inelastic or the supply curve is perfectly elastic, in which the entire tax burden is borne by consumers.

mentioning concerning this exercise. Firstly, the observations pertaining to the Autonomous Regions of the Azores and Madeira were excluded, as transactions in the said regions are subject to different VAT rates. Secondly, as the breakdown of expenditure in the HES is, in several cases, insufficient, it was necessary to use the shares resulting from the previous survey (2000 Households' Budgets Survey)⁹ in several categories. Thirdly, the analysis is restricted to VAT, although the data are affected by other indirect taxes such as the Tax on Oil Products in the case of expenditure on fuels and Car Tax which is included in the amounts spent on the acquisition of new motor vehicles. As the available information does not allow an accurate estimate of these effects to be produced, they were not considered in the analysis. Lastly, in the HES, as data on household expenditure were collected between October 2005 and October 2006, the 21 per cent standard rate of VAT, then in force, was taken into account.

The classification of taxes on the basis of the respective redistributive effects is not straightforward. In theory, given a certain income level, a tax is proportional when the income elasticity of the tax is equal to one, progressive if it exceeds this value and regressive if the elasticity is less than one. It can be shown that this definition corresponds to assuming a tax as proportional, progressive or regressive depending in whether the marginal tax rate is equal to, higher or lower than the average tax rate. Apart from the usual difficulties associated with its implementation, this definition raises additional questions in the case of indirect taxation. The average tax rate can be defined as the ratio between the amount of indirect taxes and income $\left(\bar{T}_I = \frac{Tax}{Income}\right)$ or expenditure $\left(\bar{T}_E = \frac{Tax}{Exp.}\right)$. The classification of an indirect tax as far as redistributive effects are concerned is based on the analysis of how these average rates evolve with income.¹⁰ Thus, an indirect tax is progressive, proportional or regressive relative to income if the respective average rate $\left(\bar{T}_I\right)$ increases, remains constant or declines along the distribution of income. Similarly, an indirect tax is progressive, proportional or regressive relative to expenditure if the relationship between the average rate \bar{T}_E and income is rising, constant or decreasing. In this paper, the tax is VAT, expenditure used in the calculation of the average rate \bar{T}_E is individual household expenditure excluding VAT, the denominator of \bar{T}_I is households' net income and the distribution of income relevant for determining redistributive effects corresponds to net income per equivalent adult. It should also be noted that, in the case of the analysis of the progressivity/regressivity of indirect taxation to income, it would be more suitable to use gross income for the calculation of the average rate, as this would make it possible to conclude whether taxation on consumption strengthens or partially offsets the progressive effect of taxation on income. Data on gross income, however, were not included in available HES information.

Chart 6 presents the distribution of the number of households according to the average VAT rate. Most households (around 65 per cent) paid an average VAT rate of between 10 and 14 per cent, in 2005-2006. The median and the unweighted average of this distribution are quite similar at almost 12 per cent (the average rate weighted for each household's expenditure would have been slightly

(9) This procedure was adopted for the following expenditure categories: bread and bakery products, cookies and biscuits; other cereal products; sausages, dried, salted or smoked meat and offal; canned fish, crustaceans and shellfish, prepared and semi-prepared products; honey and sweet products based on fruits; salt and spices; prepared ferments and soups; television and radio fees and rental equipment for leisure and culture.

(10) Income is the most frequently used tax base, as it is a good proxy of the ability to pay and the welfare level of households. Several authors, however, consider that consumption is a fairer tax base as it corresponds to what individuals take out of society. The difference between the two alternative tax bases is not clear cut when lifetime income is the focus of the analysis, as it often happens in the literature.

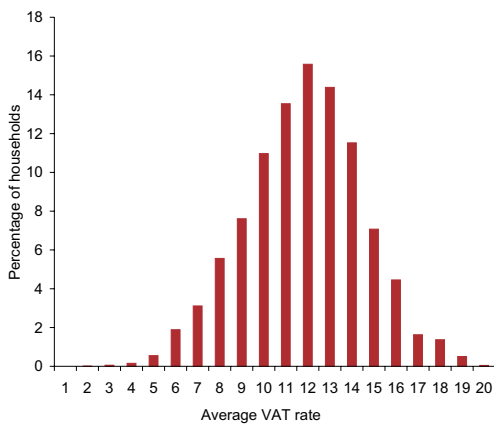
higher). It should be noted that this average tax rate may differ from the rate implicit in the economy as a whole, as it only takes into account the VAT paid by households. Both firms and general government sectors cannot deduct VAT as final consumers and on the production of exempt goods and services, whose amounts are not considered in this analysis.

Chart 7 shows the proportion of expenditure, net of VAT, by rates for equivalent adult net income deciles in the HES. According to the results obtained, the proportion of expenditure subject to the reduced rate of VAT declines with the increase in equivalent adult net income and the said proportion which is subject to the standard rate rises. In the first income decile, the proportions of expenditure subject to reduced and standard rates total 43 and 37 per cent, respectively, and in the last income decile are 29 and 47 per cent. The share of exempt expenditure in terms of overall expenditure is reasonably constant along income distribution, with the exception of the highest incomes in which there is a minor increase. This result probably stems, to a large extent, from the above referred to expenditure pattern on education. The proportion of consumption subject to the intermediate rate is very stable over income distribution as a whole. This analysis overall suggests that VAT is slightly progressive relative to expenditure although Chart 7 does not allow a clear cut conclusion to be drawn in respect of income. This hypothesis is confirmed by Chart 8 which shows a positive relationship between the average VAT rate (calculated in relation to expenditure net of this tax) and equivalent adult income, with the exception of the first income decile on which VAT appears to be proportional.

The analysis of VAT's progressivity/regressivity relative to income is illustrated by Chart 9, which presents the relationship between the average tax rate, defined as being VAT as a percentage of household net income, and equivalent adult net income. Although VAT is clearly regressive when passing from the first to the second income decile, this result may, in several cases, be influenced by very low stated net monetary incomes, in particular given the respective household expenditure. Regressivity is still

Chart 6

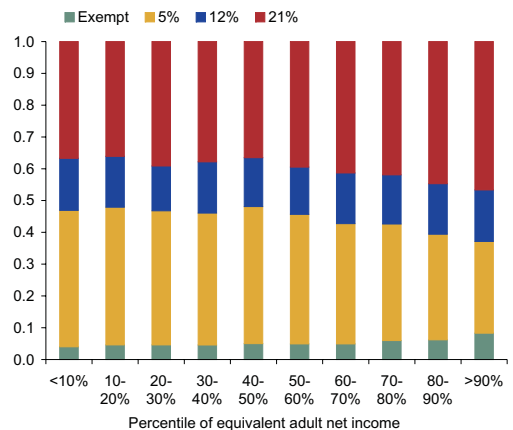
DISTRIBUTION OF THE NUMBER OF HOUSEHOLDS BY AVERAGE VAT RATE



Sources: INE and authors' calculations.

Chart 7

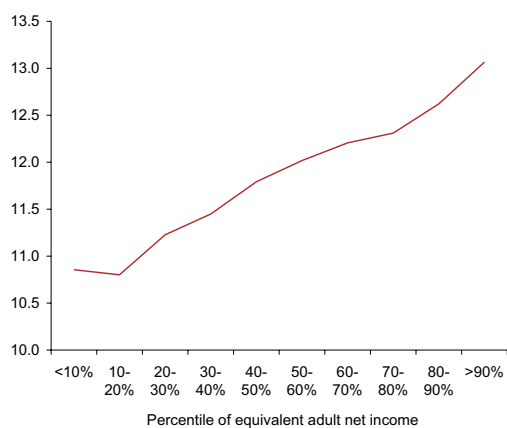
BREAKDOWN OF EXPENDITURE (NET OF VAT) BY VAT RATES



Sources: INE and authors' calculations.

Chart 8

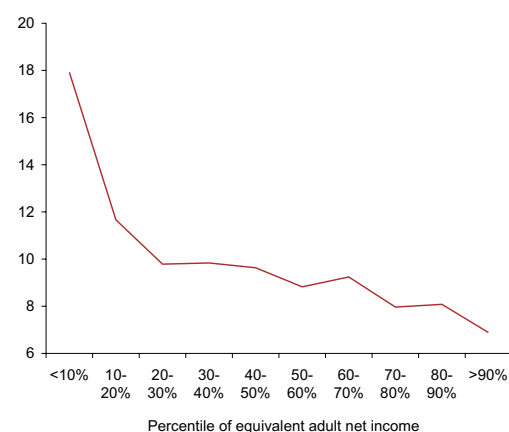
AVERAGE VAT RATE AS A RATIO TO EXPENDITURE (NET OF VAT)



Sources: INE and authors' calculations.

Chart 9

AVERAGE VAT RATE AS A RATIO TO NET INCOME



Sources: INE and authors' calculations.

present in the remaining distribution, although attenuated (with cases of proportionality between several income deciles). This result is in accordance with the assumption of an average propensity to consume declining with the level of income, which partially offsets the progressive nature of VAT in relation to expenditure. The average propensity to consume ranges between 1.75 and 0.58 in the first and last income deciles, respectively.

As already mentioned, policy instruments aimed at promoting equity in a given economy should be analysed as a whole. The results obtained in this paper suggest that the VAT system currently in force in Portugal is not an effective instrument for complementing the redistributive policy, which is mainly based on taxes on income and social transfers. A differentiated structure of VAT rates substantially reduces the efficiency gains associated with obtaining an important part of tax revenue through taxes on consumption, without contributing significantly to redistribution.¹¹ This prospect is in line with the results obtained by Correia (2010) who concludes, in a general equilibrium context, that a tax on consumption with a single rate, combined with a lump-sum transfer to households, may be used jointly with a tax on labour income also with a single rate to generate a certain level of tax revenue, without efficiency costs and with gains in terms of equity.

The redistributive effects of VAT in Portugal have already been analysed in two previous studies: Albuquerque and Neves (1994) and Rodrigues *et al.* (2002). In the first case, the authors used the data of the 1990 Households' Budgets Survey and the study was more comprehensive as it also focused on other indirect taxes such as the Tax on Oil Products and the Tax on Tobacco. These authors concluded that VAT was clearly progressive in relation to expenditure and to income when the first quartile of dis-

(11) Only assuming independent demands it would be possible to minimise the deadweight loss associated with consumption taxation based on different rates, as long as the goods with a more inelastic demand were more heavily taxed, as for example is the case of food. This would be, however, the opposite of what is intended in terms of redistribution.

posable income was excluded. In the second case, the authors used the 2000 Households' Budgets Survey and focused only on VAT. Their main conclusions confirm the results of Albuquerque and Neves (1994) concerning the progressivity of VAT when the tax burden relative to expenditure is considered. In relation to income, however, they classify the tax as regressive, in line with the results now obtained.

5. BREAKDOWN OF THE REDISTRIBUTIVE EFFECTS OF VAT IN PORTUGAL

In practice, the tools and indicators used to measure the redistributive effects of taxation are quite diverse. The Lorenz curve, which represents the relationship between the distribution functions of population and income, has, over the last few decades, been the most widely used graphical tool for visualising and comparing income inequality. The measurement of the distance between the Lorenz curve and the line of perfect equality in income, for each proportion of population and income, is very useful and is the basis for the Gini index concept. This index represents twice the area between the line of perfect equality in income and the Lorenz curve and, as such, is zero in the case of perfect equality in the distribution of income and is equal to one when maximum inequality occurs. Over the years, several indexes for the evaluation of progressivity in taxation, based on these concepts, have been suggested and used (see Kiefer (1984) for a description and critical assessment of the different progressivity indexes). Most of these indicators focus on the comparison between the Gini indexes before and after taxation or between the Gini indexes before taxation and for the tax itself.¹² Reference should be made to the fact that the definition and interpretation of these indicators are useful for assessing the progressivity of VAT relative to expenditure but do not make it possible to determine the effect of indirect taxation on the distribution of income, a topic also important in the context of this paper.

These indicators include, *inter alia*, the Reynolds-Smolensky index (1977), which states that the redistributive effect of a taxation structure may be measured by the difference between the before and after tax Gini indexes, i.e. $L = G_y - G_x$ (where G_y is the before tax Gini index and G_x is the after tax Gini index). The results for equivalent adult expenditure before and after VAT, based on the HES data, are presented in Table 1. The inequality in the distribution of expenditure including VAT is slightly higher than that before VAT, which confirms the classification of this tax as slightly progressive in relation to expenditure. In statistical terms, the difference in inequality is significant, as it is considerably higher than two standard deviations.

The work performed by Aronson *et al.* (1994) allows the breakdown of the redistributive effect of taxation, measured by the Reynolds-Smolensky index, into three components: vertical, horizontal and reranking. The vertical component measures the redistributive effect of taxation deriving from the ascription to each household of the average tax rate paid by similar households in terms of expenditure

(12) The use of the Gini index as a measure of inequality has been criticised in the literature. In particular, since the work of Atkinson (1970), the implications of the Gini index in terms of social welfare have been analysed. The Gini index, however, continues to be generally used in empirical studies.

Table 1

REYNOLDS-SMOLENSKY INDEX				
	Gini index before VAT (Gy)	Standard deviation of Gy	Gini index after VAT (Gx)	Redistributive effect (L=Gy-Gx)
HES (2005-2006) Equivalent adult expenditure	0.362046	0.000155	0.367175	-0.005129

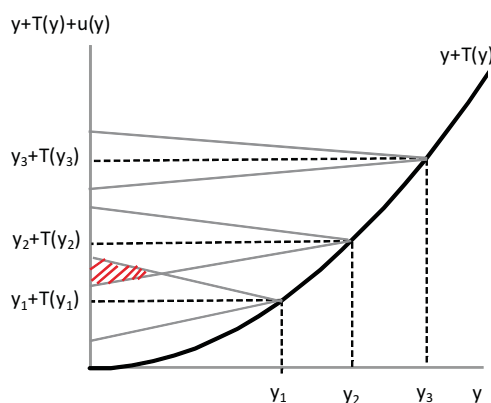
Source: Authors' calculations.

Note: The Gini indexes and respective standard deviations were calculated using DASP software developed by Araar and Duclos (2009).

before VAT. The horizontal inequality is related with the “unequal treatment of equals”, i.e., households with the same level of expenditure which are subject to different average tax rates. Reranking refers to the “unequal treatment of unequals”, i.e. the ordering of households on the basis of expenditure levels before tax may be changed as a result of the taxation system. Actual redistribution is affected by the horizontal and reranking effects, which are unwelcome from a social planner’s viewpoint. Fairness in the relative treatment of individuals through the taxation system is one of the five desirable characteristics of a taxation system as presented in the literature.¹³ Chart 10 is based on the referred to paper and is quite useful to understand this breakdown. Let T_i be the tax function of a household i with expenditure y which assumes the following expression $T_i = T(y) + u_i(y)$, where $\frac{T(y)}{y}$ is increasing, $T'(y) > 1$ and $u_i(y)$ is a disturbance term having zero mean at each expenditure level. This type of tax introduces “unequal treatment of equals” through the disturbance term, represented in the chart by the fans. It may also generate a reranking effect, which occurs in the chart when the two fans overlap. Indeed, in this case, the before tax ranking of households 1 and 2 may be reversed after tax.

Chart 10

ILLUSTRATION OF THE BREAKDOWN OF THE REDISTRIBUTIVE EFFECTS OF TAXATION



Source: Based on Aronson *et al.* (1994).

(13) The other four characteristics of a good taxation system are: efficiency, administrative simplicity, flexibility to cater for different economic circumstances and political responsibility (Stiglitz J. (2000)).

In the context of taxation on income, horizontal and reranking effects stem from the existence of different tax benefits that depend on individuals' personal characteristics, not related with income levels, or which are subject to specific thresholds. In the case of indirect taxation, these effects result from the fact that households with the same level of expenditure do not necessarily have the same structure of consumption of goods and services, even adjusting for different household compositions, and the tax has several rates.

According to Aronson *et al.* (1994), in a population split into N classes ($k = 1, \dots, N$), such that in each class households have similar expenditure levels before tax (y_k), ordered increasingly, ($y_1 < y_2 < \dots < y_N$), the overall redistributive effect may be expressed as: $L = (G_y - G_0) - \sum_{k=1}^N \theta_k G_k - R$, where G_0 represents the Gini index for after tax expenditure obtained with the replacement of the after tax expenditure by a new one obtained through the use of the average tax rate of the class; θ_k is the product of population and expenditure shares of class k ; G_k is the Gini index of expenditure of class k ; and R is the reranking effect.¹⁴ The first two terms measure vertical redistribution, V , and horizontal inequality ("unequal treatment of equals"), H , respectively. According to Atkinson (1979) and Plotnick (1981), the reranking effect, R , may be measured as $R = G_x - C_x$, where C_x is the Gini index of after tax expenditure based on the ordering of the distribution of the before tax expenditure. Thus, $L = V - H - R$.

In practice, the fact that identical before tax expenditure among households is not observed implies that the above mentioned breakdown cannot be applied directly. This question was studied in depth by van de Ven *et al.* (2001). The authors concluded that the use of arbitrary classes of almost-equals produces misleading results. The analysis showed, however, that the increase in the bandwidth of almost-equals classes has two effects, one that improves and another that worsens the actual estimate for the redistribution effect. Owing to the decrease in the number of classes, the averaging of before tax expenditure of almost-equals classes reduces the degree of breach of the progressivity assumptions underlying the effective tax schedule (with an increase in H and R and, consequently, in V). On the contrary, the inclusion of more differentiated households into close-equals classes implies that increasing proportions of V and R observed in a given sample population are attributed to H (the effect on H is, as such, undetermined). The combination of the two effects suggests that there is an optimal bandwidth for almost-equals classes that minimises the error associated with the estimate of the effective tax schedule. In practice, this one may be obtained through the maximisation of the estimate derived for V . After this step, the reranking measure, R , may be calculated directly from the non-grouped values and the horizontal effect may be finally derived from $H = V - R - L$.

The results of the application of this methodology to VAT in Portugal, using the HES information, are presented in Table 2. The relevant bandwidth for the definition of the almost-equals classes, obtained from the maximisation of the vertical redistributive effect, is 50 euros on an annual basis. The fact that the bandwidth is quite small means that the averaging benefits diminish reasonably quickly relative to

(14) If classes of almost-equals are used, as must necessarily be the case with the applications to survey data, the formula presented has to be slightly modified, as described in van de Ven *et al.* (2001). In particular, G_y is obtained through the replacement of before tax expenditure by the unweighted average of each class.

Table 2

RESULTS OF THE BREAKDOWN OF THE REDISTRIBUTIVE EFFECTS OF VAT							
	L	V	% de L	100H	% de L	100R	% de L
HES (2005-2006)							
Equivalent adult expenditure	-0.0051	-0.0050	96.8	-0.0017	-0.3	0.0181	3.5

Source: Authors' calculations.

Note: The calculations used DASP software developed by Araar and Duclos (2009).

the increase in costs from the inclusion of heterogeneous households in terms of expenditure in the different classes. According to the values obtained, the VAT horizontal effect is very small, not contributing significantly to the reduction of the overall redistributive effect (the contribution accounts for no more than -0.3 per cent). Similar households in terms of before tax expenditure are not expected to be subject to different actual VAT rates. The reranking effect is more important, as 3.5 per cent of the overall redistributive effect in 2005-2006 stems from the fact that the ranking of households with different before tax levels of expenditure is modified as a result of VAT. As a whole, these results show that the progressivity of VAT relative to expenditure is not particularly affected by adverse factors in terms of the relative fairness of a tax system.

6. CONCLUDING REMARKS

Distribution issues related with VAT in Portugal have always been relevant and have justified the option for several rates at the time of the introduction of this tax. Additionally, the fact that VAT has frequently been used as a key fiscal policy instrument over the last few years has made a thorough assessment of its distributive effects even more important. The analysis performed in this paper is based on the information compiled in the context of the HES and aims to evaluate the progressivity/regressivity of VAT, with the structure in force in 2005-2006.

Regarding consumption patterns, the results obtained for the relationship between the share of expenditure and net income distribution for classes of goods and services are, in most cases, in line with economic theory predictions. The relationship is negative in the case of goods such as food and positive for services such as recreation and culture and restaurants and hotels. It is also important to highlight that in the case of several services which are exempt or taxed at the reduced or intermediate VAT rates, particularly education, there is a positive relationship between the share of expenditure and the level of income. This outcome suggests that reasons other than distribution issues, such as the fact of being merit goods, may have been relevant to the definition of the lists of goods and services exempt or subject to the different VAT rates.

VAT appears to be a slightly progressive tax relative to expenditure, with the exception of the first and second income deciles, in which it is highly likely to be proportional. This result is confirmed by the Reynolds-Smolensky index, which evidences a statistically significant negative value. Relative to income, VAT appears to be clearly regressive from the first to second income deciles, though this out-

come may be affected by very low stated monetary net incomes, given expenditure levels. Regressivity is still present for the remaining distribution of net income, though mitigated (with several cases of proportionality between income deciles). As the multi-rate structure of VAT implies sizeable administration costs and substantially limits the efficiency gains associated with the change in the tax burden in favour of consumption taxation, income redistribution should be predominantly pursued using other tools such as direct taxation and social transfers.

Lastly, an analysis based on the breakdown of VAT's distributive effects relative to expenditure into its vertical, horizontal and reranking components was performed. The objective was to examine whether the horizontal and reranking effects, undesirable in terms of the fairness of the tax system, were important in the case of VAT in Portugal. The conclusion was that presently these effects are minor, and as such may be disregarded.

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