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Who Pays More?

Heterogeneity in Effective VAT Rates Across Native and Migrant Households

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Abstract: This paper contributes to the literature on the distributional properties of VAT, analysing who bears higher VAT payments between native and migrant households in France, Germany and Spain. The question is of interest from both a distributional and fiscal perspective, in keeping with the ongoing debate of the net fiscal impact of immigration. Using data from the 2010 EU HBS and a simple VAT calculator, we show the existence of gaps in effective VAT rates between native and migrant households in France and in Spain, while no significant gap is observed in Germany. Our results also highlight substantial heterogeneity in effective VAT rates across regions and the degree of urbanisation, confirming the existing evidence on the regressivity of VAT with respect to income. These findings suggest that the consequences for fairness of VAT reforms should be carefully assessed and advocate for the importance of considering indirect taxation when assessing the fiscal cost of migration.

Keywords: VAT, redistribution, migration.

JEL classification: H24, R20, D12.

1. Introduction

This work employs a simple Value Added Tax (VAT) simulator run on data from the 2010 EU Household Budget Survey (EU HBS) to study the distributional properties of the Value Added Tax in Germany, France and Spain, identifying how effective tax rates vary across incomes and differentiating between resident and migrant populations.

Value Added Tax (VAT) is a key element of the tax revenue mix of most advanced economies, averaging 20% of OECD countries' tax revenues

The views expressed are purely those of the authors and may not in any circumstances be regarded as stating an official position of the European Commission.

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(OECD, 2019). Its role as a key fiscal policy instrument is likely to be enhanced in the current economic climate for several reasons.

Firstly, as a response to the COVID-19 pandemic, some governments implemented significant fiscal stimulus packages aimed at cushioning the economic consequences of the pandemic and preparing the ground for the recovery. Among others, in June 2020, Germany released a € 130 billion stimulus including a reduction in the standard and the reduced VAT rates until the end of 2020 (D'Acunto *et al.*, 2020). Various other countries implemented VAT deferrals and similar measures[1].

Secondly, following the pandemic, the general government budget deficit in the euro area is expected to reach 8.5% of the GDP in 2020, compared to 0.6% in 2019 (ECB, 2020). The extent to which future consolidation efforts will involve reforms of consumption taxes is still to be seen. Nevertheless, recent history has taught us that reforms to VAT sustained the fiscal consolidation efforts of many advanced economies in the aftermath of the Great Recession. Following a decade of relative stability, the average standard VAT rate among OECD countries increased from 17.7% in January 2009 to 19.3% in January 2015, with increases primarily taking place in countries of the European Union (OECD, 2018).

Thirdly, the recent policy agenda has seen tax shifts from labour to consumption as growth-friendly policy measures that would improve competitiveness, reducing distortions (e.g. European Commission, 2018).

Despite being efficient from a revenue raising point of view, consumption taxes, and VAT among them, are regressive from a distributional perspective. Reduced rates applied to specific categories of goods are ineffective in counterbalancing these regressive elements, which would be better addressed by direct distributional instruments (de Mooij, Keen, 2012; European Commission, 2018). Regressive elements can also be mitigated by longer-term employment effects in case of tax shifts from labour to consumption (Pestel, Somers, 2017; Curci, Savegnago, 2019).

The contribution of the study to the existing literature is twofold. Firstly, it adds to the existing body of evidence on the distributional properties of VAT. Secondly, it contributes to the debate on the net fiscal cost of migration by investigating the extent to which migrant and native populations differ in terms of the share of resources devoted to VAT payments.

From a fairness point of view, recent microsimulation studies confirm the regressive nature of VAT. Decoster *et al.* (2010) simulate a decrease in social insurance contributions accompanied by a VAT increase for four European countries (Belgium, Hungary, Ireland and the United Kingdom). They find that indirect taxes are regressive with respect to disposable income, with lower income households suffering the most from the reform. The results are consist-

[1] A list of VAT-related measures implemented by countries in response to the pandemic can be consulted here: https://globalvatonline.pwc.com/covid-19-summary.

ent with Thomas and Picos-Sánchez (2012). The authors use the OECD taxing wages simulation model, augmented by a VAT simulator based on HBS data, to study the effect of a 5 per cent reduction in social insurance contribution rates (SIC) compensated by a VAT increase in 13 European countries. The results point towards households with non-working members – for instance the unemployed and pensioners – suffering the most from the reform as the SICs paid by these types of households were low in the baseline. Pestel and Sommer (2017) show that, in Germany, an increase in VAT counterbalanced by a reduction in personal income taxes would lead to worse distributional outcomes than if the same VAT increase was counterbalanced by a reduction in social insurance contributions. The higher degree of progressivity of personal income tax compared to social insurance contributions explains the result. Bach *et al.* (2006) use a behavioural microsimulation model allowing for labour supply responses, finding that a shift of the tax burden from labour to consumption for Germany would have a slightly positive effect on labour supply but an overall modest increase in income inequality.

Despite some insights from the studies mentioned above, differences in the indirect tax burden across socio-economic groups are less frequently analysed, at least in the European context. Understanding the distributional effects across different socio-economic groups is fundamental to understanding the effects of VAT on horizontal equity. We hence add to this literature by studying the differences in effective VAT rates between resident and migrant populations, further differentiating between EU and non-EU migrants.

Migrant households typically show different consumption and saving behaviours than natives because of heterogeneity in income, saving and consumption behaviours[2]. In the presence of reduced VAT rates, as well as VAT exemptions, the differences in consumption patterns might lead to a different effective VAT burden between migrant and native households, implying concerns for horizontal equity across socio-economic groups. We hence contribute to the existing literature on the net fiscal cost of migration by investigating the widespread assumption that migrants and natives with similar incomes are displayed analogously[3].

Our findings support the existing evidence on VAT regressivity with respect to income. We also show that gaps exist in the share of household income devoted to VAT payments between native and migrant households in Spain and, only for non-EU migrants, in France. No significant gap is observed in Germany. The country differences potentially stem from the specific consumption patterns of the population of the country analysed and/or the differences in their VAT systems. Finally, we find significant differences in effective VAT rates across regions, as well as across the degree of urbanisation.

[2] See Carroll *et al.* (1999); Piracha and Zhu (2011); Dustmann *et al.* (2017), among others.
[3] See Dustmann and Frattini (2014); Hansen *et al.* (2017) and Ruist (2020) for recent examples.

These findings highlight the existing trade-off between vertical and horizontal equity: taxing different goods at different rates tends to improve vertical equity but can worsen horizontal equity in the presence of heterogeneous consumption preferences[4].

The paper is structured as follows: Section 2 describes the data and the methods used in our analysis. It introduces the simple VAT calculator used for the analysis, provides descriptive evidence on effective VAT rates faced by native and migrant households and introduces the econometric model used for the analysis. Section 3 discusses the main results for France, Germany and Spain. A conclusion follows.

2. Data and methods

Our paper makes use of data from the 2010 EU HBS[5] – a survey of private households carried out regularly under the responsibility of the National Statistical Institutes in each EU Member State. The data contain information on household expenditure on goods and services for final consumption with considerable detail, plus information on income and some demographic and socio-economic characteristics.

In the analysis we study how effective VAT rates[6], i.e. the share of household income devoted to VAT payment, vary across three migration groups, namely native households, EU migrant households and non-EU migrant households. The migrant status is defined by citizenship. Please note that migrants from outside the EU differ substantially in their origin in the three countries analysed.

The analysis focuses on three out of the four largest EU economies, i.e. France, Germany and Spain. Italy is not included in the analysis because household income data are not available in the 2010 EU HBS. The 2010 data are the latest available at the time of writing.

Section 2.1 describes the simple VAT simulator used to compute the effective VAT tax burden faced by households in our sample. Section 2.2 provides descriptive evidence of the heterogeneity in effective VAT rates between migrant and native households. Section 2.3 introduces the econometric setting used to identify the main drivers of this heterogeneity.

[4] The notion of horizontal equity has various interpretations in the literature. For example, according to Roemer (1998), differences in consumption behaviour would not violate the principal of equality in opportunity, and, depending on the definition of horizontal equity, might not violate horizontal equity (see, e.g. Auerbach and Hassett (2002) for a discussion on the definition of horizontal equity).

[5] More information about the HBS can be found on the EUROSTAT website: https://ec.europa.eu/eurostat/web/microdata/household-budget-survey.

[6] In the literature, this is also named as an effective VAT burden, since we do not consider the tax base (taxable consumption) in the denominator, but the income.

2.1. Calculation of effective VAT rates

VAT is a consumption tax levied on the value added to goods and services along the whole supply chain. The tax is paid by the final consumer and it is defined as a percentage of the purchasing price, including other taxes or excises. We compute effective VAT rates as the ratio between household level VAT payments and household income. To do so, we set up a simple microsimulation model that simulates indirect taxes for France, Germany and Spain on the basis of household expenditures from the EU HBS and 2010 VAT rules. Our simulations of VAT cover the standard rate, the reduced rates, the zero rate and the exempted goods, although it does not distinguish between a zero rate and VAT exemption. We assume full pass-through of indirect taxes to the consumer[7]. Information on relevant VAT rates to be applied to goods and services is based on the European Commission (2010) and the Worldwide VAT, GST and Sales Tax Guide[8]. Both sources provide information about the value added tax, goods and services tax and sales tax systems in the European countries.

The VAT structure in 2010, reported in Table 1, differs substantially between France, Germany and Spain. The standard rate, applied to most goods and services, is 19% in Germany, 19.6% in France and 16% in Spain (raised to 18% during 2010). A 7% reduced VAT rate, applied to a selection of goods and services, is present in Germany and Spain (raised to 8% in Spain during 2010), while the reduced rate is 5.5% in France. Super-reduced rates are present in Spain and France, which are applied to special goods such as pharmaceuticals. Zero rate and exceptions are present in all three countries, following the provisions of the EU VAT Directive.

The simple VAT calculator applies the relevant VAT rate to each detailed expenditure recorded in the EU HBS, using the highest possible level of granularity. To consider the reform that modified the standard and the reduced VAT rates in Spain in mid-2010, for modelling purposes we use the average of the pre- and post-reform values of the relevant rates.

When one expenditure category includes goods and services that are taxed at different rates, we apply the rate that is ranked first in the list provided by the European Commission (2010). This limitation might affect the

[7] Due to the assumption of full pass-through which is common in the literature, we might overestimate the real VAT burden of households. Even if full pass-through of VAT changes to consumer prices is almost always assumed in distributional analyses, recent empirical studies show that the degree of pass-through depends on the different type of VAT reforms. For instance, Benedek *et al.* (2020), focusing on the changes in VAT rate in 17 European countries over the period 1999-2013 for a large number of commodities, find evidence of full pass-through for changes in the standard VAT rates, but a generally lower degree of pass-through for changes in reduced VAT rates.

[8] Worldwide VAT, GST and Sales Tax Guide 2010 by Ernst & Young (2010). Retrieved from: http://www.ey.com.

Table 1: VAT rates across countries, 2010

Country	VAT	VAT reduced	VAT super-reduced
France	19.6	5.5	2.1
Germany	19.0	7	-
Spain	16/18	7/8	4

Note: In Spain, rates were increased in July 2010.
Source: European Commission (2010).

precision of the simulations. Table A1 in the Appendix gives an overview of the specific products and the corresponding VAT rates used in our model.

We hence simulate household VAT liabilities as follows, accounting for the fact that observed expenditure on goods and services already includes VAT. Each commodity k has a price net of VAT p_k and a VAT rate t_k. The consumer price cp_k can therefore be defined as:

$$cp_k = (1 + t_k) * p_k \quad [1]$$

Expenditure e_k is therefore defined as the consumer price cp_k times the quantity of the commodity consumer price q_k:

$$e_k = cp_k * q_k = (1 + t_k) * p_k * q_k \quad [2]$$

Using [1] and [2], we calculate the VAT burden T_k for each commodity:

$$T_k = t_k \bullet p_k \bullet q_k = \frac{t_k}{1 + t_k} \bullet e_k \quad [3]$$

To calculate the total VAT burden T of a household, we sum up all commodities. We compute the effective VAT rates $eVAT$ dividing T by the total disposable household income Y:

$$eVAT = \frac{T}{Y} = \frac{\sum_{k=1}^{n} T_k}{Y} = \frac{\sum_{k=1}^{n} \frac{t_k}{1 + t_k} \bullet e_k}{Y} \quad [4]$$

As a way of validating the simulations of our simple model, we compare the total VAT payments predicted by our model with the European Commission (2018) estimates of VAT liabilities paid by households. Overall, we cover 87.7% of the VAT liabilities in France, 97% in Germany and 91% in Spain (see Table 2).

2.2. Descriptive evidence on effective VAT rates

This subsection provides descriptive evidence on how effective VAT rates vary across household migration statuses. We use the information on

Table 2: Macrovalidation of VAT liabilities, 2010

	France	Germany	Spain
Model prediction (MEUR)	88,870	122,200	40,130
European Commission (2018) – year 2010 (MEUR)	101,311	125,930	44,103
in %	87.7%	97.0%	91.0%

Source: Author's calculations and European Commission (2018).

citizenship to divide households into three categories: native, EU migrant and non-EU migrant. We define as native those households whose members are all citizens of the country analysed. EU migrant households are those in which at least one member is a citizen of another EU country (but none of countries outside the EU). Non-EU migrant households are those including at least one citizen of a country outside the EU.

Table 3 highlights significant differences in the effective VAT rates faced by households with different migration backgrounds. In the three countries, native households pay, on average, lower effective VAT rates than both EU and non-EU migrant households. T-tests confirm the statistical significance of the differences. In France, EU migrants pay, on average, the highest VAT rate (10.75%), followed by non-EU migrant households (10.21%) and native households (9.13%). In Germany and Spain, non-EU migrants face, on average, the highest effective VAT rates (11.07% and 11.53%, respectively), followed by EU migrants (10.37% and 9.69%) and natives (9.88% and 8.68%).

Various factors such as income, expenditure or consumption behaviour are likely to explain at least part of the observed heterogeneity in effective VAT rates observed across migration statuses. Table 3 therefore also highlights the heterogeneity of household financial circumstances across the three migration statuses. In France, native households are, on average, significantly richer than EU migrant households, and non-EU migrant households are significantly poorer. The differences could be justified, at least partly, by larger household sizes and higher shares of working age populations among migrants[9].

In Germany, native and EU migrant households do not show statistically significant differences between their levels of income, while native households are significantly richer than non-EU migrants are. In Spain, both EU and non-EU migrant households report a significantly lower income than native households.

Total household expenditure follows a pattern similar to income. In Germany, EU migrant households have similar expenditure to native house-

[9] A non-EU migrant household has an average size of 3.93 members, while a native household has, on average, 2.52 persons (see Table A1 in Appendix). Also in the SILC data, migrant households (Non-EU) tend to have a higher household income in France.

Table 3: Main household characteristics

		Native households	EU migrant households	Non-EU migrant households	P value t-test (vs native)	
		mean	mean	mean	EU migrant	Non-EU migrant
France	Effective VAT rate	9.13%	10.75%	10.21%	0.00	0.00
	Household income	44,460	39,013	47,530	0.05	0.00
	Household expenditure	33,685	32,113	38,431	0.21	0.00
	Expenditure rate	0.88	1.02	0.93	0.00	0.00
Germany	Effective VAT rate	9.88%	10.37%	11.07%	0.02	0.00
	Household income	42,433	41,608	31,410	0.23	0.00
	Household expenditure	34,314	33,578	26,460	0.18	0.00
	Expenditure rate	0.89	0.90	0.92	0.35	0.01
Spain	Effective VAT rate	8.68%	9.69%	11.53%	0.00	0.00
	Household income	33,265	26,346	22,380	0.00	0.00
	Household expenditure	33,787	26,072	24,587	0.00	0.00
	Expenditure rate	1.10	1.13	1.30	0.00	0.00

Source: Author's calculations.

holds, while non-EU migrant households have significantly less expenditure. In France, natives report the highest total expenditure, followed by non-EU migrants and EU migrants. In Spain, natives spend more than EU migrants and these more than non-EU migrants.

Holding income constant, some types of households could face different VAT payments if their expenditure (or saving) behaviour were different from those of the other groups. Table 3 reports the expenditure rate, defined as the ratio between total household income and total expenditure. The ratio is computed separately for every household and then averaged within migration groups. This explains why the expenditure rates differ from the ratio between the average household expenditure and average household income reported in Table 3. We find that, in the three countries, both EU and non-EU migrant households consume a higher share of their income than native households do. Since the expenditure rate is equivalent to one minus the savings rate, we can compare these figures with macro data from the OECD[10]. We find that the 2010 net household saving rate for Germany and France was about 10.3% and 10.5%, hence close to our finding. The comparison is not quite as accurate in Spain (and in France for EU migrant households), where we

[10] The OECD defines net household savings as household net disposable income plus the adjustment for the change in pension entitlements less household final consumption expenditure. Data from: OECD, *National Accounts at a Glance, Household Savings (indicator)* (accessed on 13 August 2020).

find evidence of an expenditure rate above one, equivalent to a negative savings rate, while OECD data highlight a savings rate of around 5.1%. In this respect, it should be noted that mean expenditure rates can be influenced substantially by extreme values. Looking at the median, native households in Spain end up with a savings rate of around 1%, the total population with a savings rate of 0%. Additionally, the result for Spain highlights the consequences of the strong economic downturn of the financial crisis, when a significant share of the population had to rely heavily on their savings due to substantial losses in income (Arce *et al.*, 2013).

Additional characteristics, such as the household type, the main activity status of the household, the education level of the head of the household – but also regional distribution – differ substantially across migration statuses. Detailed information on those differences by country can be found in Table A2 to Table A4 in the Appendix.

In addition to total expenditure, the type of goods and services purchased is also likely to influence effective VAT rates since different VAT rates are applied to different goods and services. Table 4 reports the share of household expenditure devoted to 12 main categories of goods and services recorded in the EU HBS, built by aggregating the detailed expenditure.[11] The table allows for the appreciation of the heterogeneity of the expenditure patterns of native and migrant households between countries.

It should be noted that the largest expenditure share in the three countries corresponds to housing. We observe substantial differences in the share of expenditure devoted to housing by the three migration statuses across the three countries. For example, non-EU migrant households spend more on housing than native households in Germany and Spain, while the opposite is true in France. Heterogeneity also occurs in the second and third largest expenditure categories, namely food and transport. While non-EU migrant households spend 2.6 percentage points more on food than native households in Germany, the opposite is true in France, where native households spend over 1 percentage point more than EU and non-EU migrants.

Table 4 also highlights some unanticipated results. For example, on average, EU-migrants spend more of their income on education than natives in France and Germany, but less in Spain. In France, non-EU migrants spend a higher share of their expenditure on restaurants and culture than both natives and EU-migrants, while the opposite is true in Germany and Spain. The results stem directly from the EU HBS data, which can arguably be

[11] The 12 main categories are 1) Food and non-alcoholic beverages; 2) Alcoholic beverages, tobacco and narcotics; 3) Clothing and footwear; 4) Housing, water, electricity, gas and other fuels; 5) Furnishings, household equipment and routine maintenance of the house; 6) Health; 7) Transport; 8) Communication; 9) Recreation and culture; 10) Education; 11) Restaurants and hotels; 12) Miscellaneous goods and services.

Table 4: Household consumption behaviour across countries

	France			Germany			Spain		
	Native	EU migrant	Non-EU migrant	Native	EU migrant	Non-EU migrant	Native	EU migrant	Non-EU migrant
Household expenditure	33,685	32,113	38,431	34,314	33,578	26,460	33,787	26,072	24,587
– Food	16.5%	15.3%	15.3%	12.2%	12.4%	14.8%	14.7%	14.7%	15.3%
– Alcohol	2.6%	2.6%	2.2%	1.6%	1.5%	1.6%	2.2%	3.9%	2.1%
– Clothing	4.0%	3.3%	5.1%	4.6%	4.7%	5.1%	5.8%	5.3%	6.9%
– Housing	25.6%	27.9%	24.1%	29.2%	30.1%	31.1%	28.1%	30.3%	29.4%
– Housing equipment	4.9%	4.9%	4.8%	4.8%	4.7%	3.4%	4.9%	3.9%	4.0%
– Health	1.5%	1.5%	1.6%	3.6%	2.5%	2.7%	3.1%	2.9%	1.9%
– Transport	14.7%	14.2%	14.4%	14.6%	15.9%	14.3%	13.1%	12.5%	13.9%
– Communication	2.8%	3.0%	2.9%	2.6%	2.9%	4.1%	3.0%	4.0%	4.1%
– Culture	7.7%	6.6%	7.7%	10.1%	8.9%	8.6%	6.4%	5.8%	5.5%
– Education	0.7%	1.0%	0.6%	1.1%	1.4%	1.5%	1.3%	0.9%	1.3%
– Restaurants	5.7%	6.3%	7.0%	4.6%	4.5%	3.7%	9.6%	8.9%	9.0%
– Other	13.3%	13.4%	14.4%	11.0%	10.4%	9.2%	7.7%	7.0%	6.5%

Source: Author's calculations.

explained by the composition and specific preferences of the native and migrant pools in the survey.

The descriptive evidence presented in this section shows that heterogeneity in effective VAT rates exists across migration statuses in the three countries. These also present important differences in terms of income, expenditure and other socio-demographic characteristics, which could explain, at least in part, the heterogeneity of effective VAT rates. We hence employ a regression analysis to study the extent to which heterogeneity in effective VAT rates persists after controlling the observed financial and socio-demographic characteristics of the households.

2.3. The econometric model

As already noted, the scope of this paper is to identify whether migrant and native households face different effective VAT rates. Although the descriptive evidence discussed in the previous section points in this direction, it is also possible that socio-economic variables different from migration statuses explain part of the heterogeneity observed. As already noted, differences in effective VAT rates can stem from differences in income, savings behaviour – more savings will lead to lower consumption and therefore a lower VAT tax burden – or from differences in consumption

behaviour, consuming different goods for which different VAT rates are applied. In addition, other socio-economic factors could help to explain differences in the effective VAT burden across households through specific consumption behaviours.

To analyse this in more detail, we set up a simple regression analysis consisting in estimating a model of the type described in equation [5]:

$$eVAT_i\,(y_i) = \alpha + \gamma_1 D_{EU} + \gamma_2 D_{Non\text{-}EU} + \delta X + \varepsilon_i \qquad [5]$$

The dependent variable *eVAT* is the effective VAT rate faced by household i. Coefficients γ_1 and γ_2 estimate differences in mean effective VAT rates between migrant and native households. In successive model specifications, we add various controls (X) to test the extent to which differences between migrant and native household persist.

In specification [2] we include total household income, as well as total consumption. Following Li and Ma (2017), who discuss several models to estimate effective tax functions, we include income with a fourth order simple polynomial that is estimated by OLS.

Specification [3] includes, among the regressors, a categorical variable, which accounts for the expenditure preferences of the household as well as regional dummies and indicators of population density.

Expenditure types are identified as low (less than 70% of household income), low-medium (70-85%), medium (85-100%), medium-high (100-115%) and high (above 115%). Despite the fact that we already have controls for income and expenditure, the variable is expected to add flexibility to our specification, capturing specific expenditure behaviours. Additionally for this specification, we also test the robustness of our results against the direct introduction of the expenditure rate in the model and the inclusion of an interaction term between income (and its polynomial) and expenditure. Results in Table A5 to Table A7 in the Appendix show that the impact of changing to one of those models is minor, leaving the coefficients of interest unchanged and significant in most specifications.

Regional dummies might be relevant to capture specific local factors common to all those living in the region (e.g. housing prices). Additionally, a population density variable allows us to distinguish between rural and urban areas. The information on the degree of urbanisation is of special interest, since the literature shows that consumption is greatly affected by regional components (see, e.g. EUROSTAT, 2010).

In specification [4], we additionally have controls for the household type, the household size, the education of the head of the household and the general employment status of the household. All these factors are expected to influence various expenditure behaviours of the households.

3. Results

The descriptive evidence presented in Section 2 highlights the existence of heterogeneity in effective tax rates paid by migrants and native households. This section presents the results of an econometric estimation.

3.1. France

The results for France are listed in Table 5. The findings from Model (1) confirm what was seen in Section 2.2, with both EU and non-EU migrant households experiencing higher effective tax rates than native households. Model (2) adds controls for income and expenditure to Model (1). The coefficients for income and expenditure have the expected indication and are statistically significant. In this specification, non-EU migrant households continue to face higher effective VAT rates than natives, while the coefficient for EU migrant households is substantially lower and loses statistical significance. The result holds in specification (3), where we include controls for expenditure behaviour, regional dummies and indicators for population density. We can also appreciate a strong regional dispersion of the effective VAT rate. While, for example, the effective VAT rate is about 0.3 percentage points higher in the Paris Basin than in the *départements* in the Île-de-France region, D'Outre-Mer showed a 0.4 percentage point lower effective VAT rate. As expected, population density is also expected to influence consumption behaviours. We distinguish between regions with high, medium and low population densities and we find that the effective VAT rate is significantly lower in rural areas than in urban ones. Regions with a medium population density have a 0.7 percentage point lower effective VAT rate than regions with a high population density. For areas with a low population density, it is even 1.1 percentage point. Adding more socio-demographic control variables (specification 4) increases the coefficient for non-EU migrants, who face effective VAT rates about 1.1 percentage points higher than native households.

Predicting the outcomes of the model (specification 4) for the different household types for France, Figure 1 highlights the statistically significant differences between the effective VAT rate faced by native and non-EU migrant households across the income distribution. EU migrant households also face higher VAT rates, but differences between native households are less clear cut. In line with the existing literature, the results confirm the regressivity of VAT with respect to income. The results also suggest that consumption behaviours specific to non-EU migrants in France lead to differences in the effective VAT rate faced, especially compared to native households. However, differences between EU-migrant households and natives are not significantly different from each other.

Table 5: Regression results – France

	(1)	(2)	(3)	(4)
	eVAT	eVAT	eVAT	eVAT
Migration status (ref. native)				
EU migrant	0.016	0.006	0.003	0.006
	(2.65)**	(1.54)	(0.64)	(1.63)
Non-EU migrant	0.011	0.006	0.005	0.011
	(10.10)**	(8.53)**	(7.90)**	(8.20)**
hh income		-0.005	-0.003	-0.003
		(36.25)**	(21.69)**	(20.98)**
hh income^2		0.000	0.000	0.000
		(17.55)**	(14.48)**	(14.01)**
hh income^3		-0.000	-0.000	-0.000
		(11.15)**	(10.17)**	(9.94)**
hh income^4		0.000	0.000	0.000
		(9.70)**	(9.06)**	(8.87)**
hh expenditure		0.003	0.002	0.002
		(66.07)**	(20.35)**	(21.03)**
Spending status (ref. high)				
Low			-0.084	-0.078
			(33.83)**	(31.91)**
Low-medium			-0.078	-0.073
			(42.66)**	(41.43)**
Medium			-0.070	-0.065
			(43.61)**	(43.47)**
Medium-high			-0.059	-0.056
			(38.45)**	(39.07)**
Region (ref. Île-de-France)				
Paris Basin			0.003	0.005
			(2.95)**	(4.18)**
North – Pas-de-Calais			-0.001	0.000
			(0.69)	(0.27)
East			0.008	0.009
			(5.54)**	(5.98)**
West			0.004	0.005
			(2.72)**	(3.21)**
South-east			0.001	0.002
			(1.08)	(1.62)
Centre-east			0.003	0.004
			(2.58)**	(3.30)**
Méditerranée			0.002	0.004
			(1.26)	(2.85)**
Départements D'Outre-Mer			-0.004	-0.003
			(3.31)**	(2.56)*
Rest			0.027	0.028
			(8.75)**	(8.77)**
Population density (ref. high)				
Medium			-0.007	-0.005
			(7.05)**	(5.28)**
Low			-0.011	-0.008
			(13.06)**	(11.28)**
Constant	0.091	0.147	0.193	0.194
	(147.82)**	(56.31)**	(68.52)**	(68.39)**
Add. controls	No	No	No	Yes
R-squared	0.01	0.51	0.60	0.62
R-squared adj.	0.01	0.51	0.60	0.62
RMSE	0.0717	0.0504	0.0456	0.0445
Observations	40,762	40,762	40,762	40,762

Note: * $p < 0.05$; ** $p < 0.01$.
Source: Author's calculations.

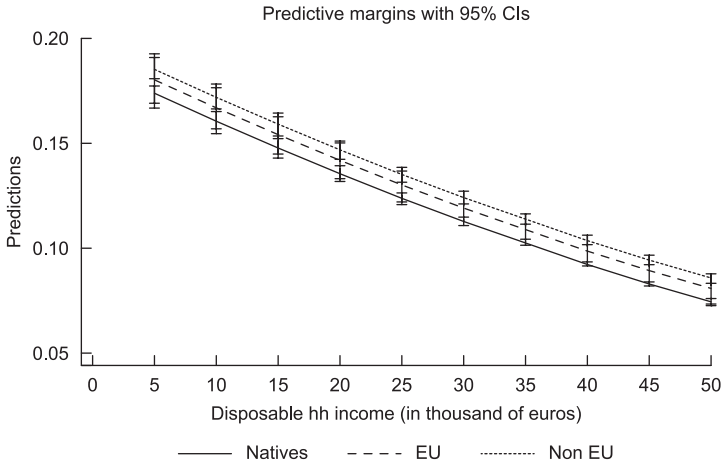

Figure 1: Model prediction of the effective VAT rate by citizenship – France (in thousands of euros).
Source: Author's calculations.

3.2. Germany

Table 6 reports the estimates of our model for Germany. The coefficients for being a migrant, either EU or non-EU, are reduced when adding controls and become statistically insignificant in specification (4). As expected, household income and expenditure in Germany are important predictors of the effective VAT rate. The coefficient for regional dummies indicates that the indirect tax burden differs significantly between regions. These differences are in the range of -0.1 percentage point to 0.2 percentage points. We also find that in areas with a medium (low) density, people face a 0.3 (0.5) percentage point lower effective VAT rate than people living in regions with a high population density.

Plotting the predicted effective VAT rate from specification (4) by migration status along with the household income, Figure 2 highlights that the model does not predict significant differences for native households and migrant households (EU and non-EU).

3.3. Spain

Table 7 reports the results of the regression analysis for Spain. The results confirm throughout the model specification that both EU and non-EU migrants face a significantly higher effective VAT rate than natives. Depending on the specification, EU migrants face an effective VAT rate between 0.7 percentage points and 1.1 percentage points higher than natives. Non-EU migrant households face even larger differences, ranging between 2.8 per-

Table 6: Regression results – Germany

	(1)	(2)	(3)	(4)
	eVAT	eVAT	eVAT	eVAT
		Migration status (ref. native)		
EU migrant	0.005	0.003	0.003	0.002
	(2.49)*	(2.59)**	(2.37)*	(1.62)
Non-EU migrant	0.012	0.002	0.003	0.001
	(6.89)**	(2.51)*	(3.62)**	(1.11)
hh income		-0.006	-0.005	-0.006
		(44.37)**	(35.18)**	(32.61)**
hh income^2		0.000	0.000	0.000
		(19.07)**	(17.72)**	(18.36)**
hh income^3		-0.000	-0.000	-0.000
		(11.67)**	(11.50)**	(12.72)**
hh income^4		0.000	0.000	0.000
		(8.27)**	(8.52)**	(9.70)**
hh expenditure		0.003	0.002	0.002
		(83.19)**	(39.15)**	(39.32)**
		Spending status (ref. high)		
Low			-0.049	-0.049
			(31.51)**	(31.43)**
Low-medium			-0.052	-0.052
			(50.54)**	(50.70)**
Medium			-0.047	-0.047
			(56.32)**	(56.90)**
Medium-high			-0.039	-0.039
			(51.39)**	(52.39)**
		Region (ref. DE0)		
DE3			-0.000	-0.001
			(1.33)	(1.39)
DE4			-0.001	-0.001
			(2.00)*	(2.11)*
DE5			0.003	0.002
			(8.46)**	(5.84)**
		Population density (ref. high)		
Medium			-0.003	-0.003
			(11.26)**	(13.87)**
Low			-0.004	-0.005
			(8.95)**	(11.93)**
Constant	0.099	0.176	0.202	0.216
	(486.21)**	(93.44)**	(100.14)**	(87.44)**
Add. controls	no	no	no	yes
R-squared	0.00	0.63	0.68	0.69
R-squared adj.	0.00	0.63	0.68	0.69
RMSE	0.0565	0.0343	0.0318	0.0315
Observations	122,373	122,373	122,373	122,373

Note: * $p < 0.05$; ** $p < 0.01$.
Source: Author's calculations.

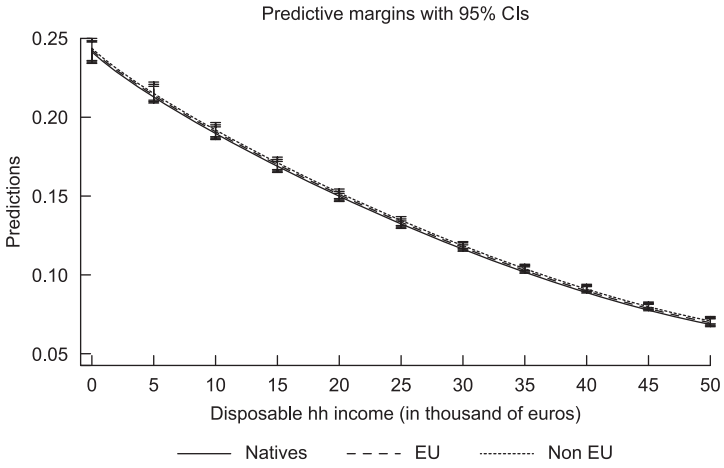

Figure 2: Model prediction of the effective VAT rate by citizenship – Germany (in thousands of euros).
Source: Author's calculations.

centage points in the simple model that has no controls for anything (1) and 1.2 percentage points when using all controls in Model (4).

Similar to France and Germany, the results highlight the importance of controls for the household financial and socio-demographic circumstances as well as for regional dummies. When looking at the population density, we find that the effective tax rate in rural areas was significantly higher (0.2 percentage points) compared to urban areas in Spain[12].

Figure 3 plots the predicted effective VAT rate from specification (4) by migration status. As expected, the chart highlights the regressivity of the VAT, and additionally the significant differences across the income distribution in Spain. For low incomes, the model predictions seem to indicate less significant differences in the predicted effective VAT rate, for natives and EU migrants at least. The differences between migrant and native households become greater further up the income distribution ladder, highlighting that, in Spain, different consumption behaviours of native and migrant households lead to a higher effective VAT rate for both EU and non-EU migrants.

Overall, in line with existing literature, our findings confirm the regressivity of VAT with respect to income. The raw data highlights differences in effective VAT rates faced by native and migrant households. Once analysed by means of a regression analysis, the differences in effective VAT rates between native and migrant households remain statistically significant in all

[12] When interpreting these results, one has to keep in mind that the crisis year of 2010 potentially (?) influenced regions across Spain differently. The impact on both income and savings across regions could be very different and could have changed substantially after the crisis.

Table 7: Regression results – Spain

	(1)	(2)	(3)	(4)
	eVAT	eVAT	eVAT	eVAT
		Migration status (ref. native)		
EU migrant	0.010	0.011	0.010	0.007
	(5.11)**	(8.50)**	(8.48)**	(5.77)**
Non-EU migrant	0.028	0.017	0.018	0.012
	(16.36)**	(16.05)**	(16.65)**	(11.24)**
hh income		-0.008	-0.007	-0.008
		(36.34)**	(28.11)**	(30.68)**
hh income^2		0.000	0.000	0.000
		(20.39)**	(19.15)**	(21.26)**
hh income^3		-0.000	-0.000	-0.000
		(15.27)**	(15.47)**	(16.98)**
hh income^4		0.000	0.000	0.000
		(12.11)**	(12.74)**	(13.96)**
hh expenditure		0.003	0.003	0.003
		(94.20)**	(41.28)**	(42.53)**
		Spending status (ref. high)		
Low			-0.024	-0.018
			(14.88)**	(10.73)**
Low-medium			-0.029	-0.024
			(24.74)**	(20.12)**
Medium			-0.029	-0.025
			(33.89)**	(28.70)**
Medium-high			-0.026	-0.023
			(40.96)**	(35.76)**
		Region (ref. North-west)		
North-east			-0.004	-0.003
			(8.05)**	(7.69)**
Madrid			-0.003	-0.003
			(4.69)**	(4.69)**
Centre			0.002	0.001
			(3.31)**	(1.58)
East			-0.003	-0.004
			(6.86)**	(7.82)**
South			0.002	0.001
			(3.86)**	(1.42)
Canarias			0.003	0.000
			(2.72)**	(0.19)
		Population density (ref. high)		
Medium			-0.000	-0.000
			(0.28)	(0.93)
Low			0.002	0.002
			(3.78)**	(3.76)**
Constant	0.087	0.147	0.152	0.141
	(321.26)**	(56.63)**	(62.46)**	(55.42)**
Add. controls	no	no	no	yes
R-squared	0.02	0.61	0.64	0.66
R-squared adj.	0.02	0.61	0.64	0.66
RMSE	0.0569	0.0359	0.0344	0.0334
Observations	62,245	62,245	62,245	62,245

Note: * $p < 0.05$; ** $p < 0.01$.
Source: Author's calculations.

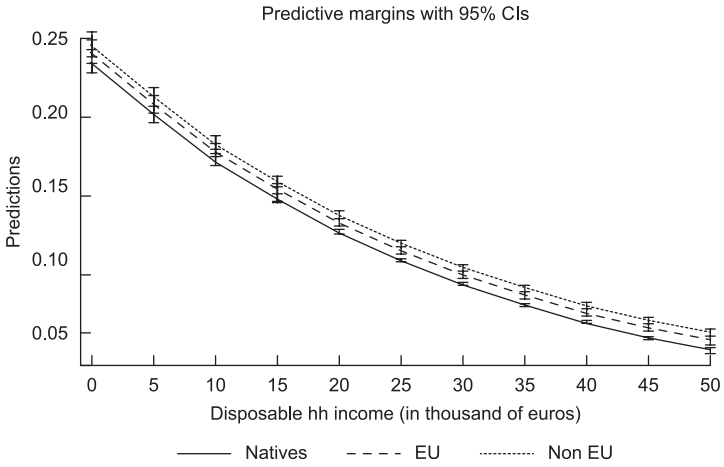

Figure 3: Model prediction of the effective VAT rate by citizenship – Spain (in thousands of euros).
Source: Author's calculations.

the model specifications for Spain (for both EU migrant households and non-EU migrant households) and France (only for non-EU households). On the contrary, in the case of Germany, when we control for the complete set of socio-economic characteristics, we see that the effective VAT rate differential between native households and migrant households is reduced in size and statistical significance.

The differences between countries are likely to be imputed to unobservable characteristics of the populations of interests – other than the socio-economic ones for which we control for – likely to influence consumption behaviours. As an example, we cannot control for cultural norms specific to the country of origin of the migrants due to the lack of relevant information in the EU HBS.

As caveats, it cannot be ruled out that unobservable characteristics are correlated with the variables of interest. In these cases, our estimates would suffer from omitted variable bias. In addition, as explained in Section 2, our migrant status is based on the citizenship of the individuals inside the household. This can be an imperfect indicator for whether a household is native or migrant, and slightly different citizenship rules in the countries of analysis may have led to slightly different definitions and compositions of migrants and natives in the analysis of the countries.

4. Conclusions

VAT represents an important item in the tax mix of the great majority of advanced economies. After the Great Recession, various EU Member

States had recourse to VAT reform for budgetary consolidations. In addition, recent years have seen a growing interest in policy aiming at switching taxation from labour to less distortionary bases, among which consumption.

The recent COVID-19 pandemic has required important policy interventions from various countries, some of them also consisting in temporary delays of VAT payments or temporary reductions in its rates. It is still early to say whether future policy interventions will also involve VAT reforms to partially consolidate public finances after the crisis. Nevertheless, it is still clear that VAT reforms represent an important tool available to policymakers for either budgetary or efficiency purposes.

Who bears the cost of VAT is hence a question of great importance. Various studies have shown the regressive nature of VAT, whose systems of reduced rates fail in counterbalancing. In this paper, we focused on who bears higher VAT payments between native and migrant households in three European countries. The question is of interest from both a distributional and a budgetary perspective, fitting into the ongoing debate of the fiscal cost of migration.

We used data from the 2010 HBS and a simple VAT calculator to compute effective VAT rates for samples of native, EU migrant and non-EU migrant households in France, Germany and Spain. Built as the ratio of VAT payments over household income, effective VAT rates capture the share of household income spent in VAT well. Following descriptive evidence showing the existence of gaps in effective VAT rates by household migration status, we perform a simple regression analysis aimed at testing the robustness of this finding to the inclusion of factors likely associated with household financial and socio-economic circumstances.

Our results confirm the existence of a gap in effective VAT rates between native and non-EU migrant households in France and in Spain. In Spain, a statistically significant gap is also observed between native and EU migrant households. We found no significant gap in Germany. In addition, we find evidence of heterogeneity in effective VAT rates across regions and across different degrees of urbanisation, confirming the correlation of these dimensions with final consumptions (EUROSTAT, 2010). The result is consistent with previous literature showing the importance of the regional dimension in affecting households' consumption behaviour[13].

Our findings also support the existing evidence of regressivity of VAT with respect to income. Whilst being essentially descriptive, our findings suggest that revenue-raising VAT reforms might have significant distributional consequences that should be evaluated in order to enhance the fairness of the tax systems. Our results indicate that both vertical and horizontal equity considerations should be taken into account, for example by broadening

[13] See, e.g. Frank *et al.* (2018) or Borozan (2018) for general regional differences. See Rehdanz (2009) or Hill (2015) for evidence of energy consumption in Germany and Austria, respectively.

the categories of goods subject to standard VAT rates and designing fiscal instruments to effectively counterbalance VAT regressivity. Moreover, the findings advocate for the importance of considering indirect taxation as well as direct taxation and benefit expenditure for the assessment of the fiscal cost of migration.

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Appendix

Table A1: VAT rates according to the EC (2010)

Category	DE	ES	FR	Category	DE	ES	FR
Foodstuffs	7 (19)	4 (7)	5.5 (19.6)	Energy products			
Water supplies	7	7	5.5	*Natural gas*	19	16	19.6 (5.5)
Pharmaceutical products	19	4 (16)	2.1 (5.5, 19.6)	*Electricity*	19	16	19.6 (5.5)
Transport of passengers	7 (19)	7	5.5	*Firewood*	7	16	5.5
Books, newspapers, periodicals				*Timber for industrial use*	7 (19)	16	19.6
Books	7	4 (16)	5.5 (19.6)	Telecommunication services			
Newspapers	7	4 (16)	2.1 (19.6)	*Phone/fax/telex/etc.*	19	16	19.6
Periodicals	7	4 (16)	2.1 (19.6)	*Pay TV/ cable TV*	19	16	5.5
Admission to cultural services	[ex] (7)	[ex] (7)	5.5 (19.6)	*TV licence*	[ex]	16	2.1
Renovation of private dwellings	19	7	5.500	Petroleum products			
Hotel accommodation	7	7	5.5	*Petrol (unleaded)*	19	16	19.6
Restaurants	19	7	5.5	*Diesel fuel*	19	16	19.6
Social services	7	7	19.6	*LPG*	19	16	19.6
Medical and dental care	7 [ex]	7	[ex]	*Heating oil*	19	16	19.6
Beverages				*Lubricants*	19	16	19.6
Spirits	19	16	19.6	Motor vehicles	19	16	19.6
Wine	19	16	19.6	Passenger transport			
Beer	19	16	19.6	*Air*	19	7	5.5
Mineral water	19	7	5.5	*Sea*	19 (7)	7	5.5
Lemonade	19	7	5.5	*Inland waterway*	19 (7)	7	5.5
Fruit juices	19	7	5.5	*Rail*	19 (7)	7	5.5
Clothing				*Road*	19 (7)	7	5.5
Adults	19	16	19.6	Bars and cafés			
Children	19	16	19.6	*Bars and cafés*	19	7	5.5

Table A1: (continued)

Footwear				*Night clubs*	19	7	5.5
Adults	19	16	19.6	*Alcoholic beverages*	19	7	19.6
Children	19	16	19.6	Immovable property			
Tobacco	19	16	19.6	*Social housing*	19	4 (7)	5.5 (19.6)
Hifi-Video	19	16	19.6	*Renovation and repairing*	19	7	5.5 (19.6)
CD/CD-ROM	19	16	19.6	*Building land*	[ex]	16	19.6
Household electrical appliances	19	16	19.6	*Supplies of new buildings*	[ex]	7 (16)	19.6
Furs	19	16	19.6	*Construction work on new buildings*	19	4 (7)	19.6
Jewels	19	16	19.6	Services supplied by lawyers	19	16	19.6 (5.5)

Source: European Commission (2010).

Table A2: Summary statistics for Germany

	Natives		EU migrants		Non-EU migrants		t-test (p-values)	
	mean	SD	mean	SD	mean	SD	EU	Non-EU
Effective VAT	0.0988	(0.06)	0.1037	(0.06)	0.1107	(0.05)	0.0173	0.0000
hh income	42,433	(27,121)	41,608	(28,651)	31,410	(21,167)	0.2292	0.0000
Savings	8,119	(18,412)	8,030	(18,543)	4,950	(13,300)	0.8781	0.0000
hh expenditure	34,314	(21,551)	33,578	(20,827)	26,460	(17,109)	0.1786	0.0000
Expenditure rate	0.8897	(0.41)	0.9005	(0)	0.9201	(0.36)	0.3478	0.0095
				Expenditure type				
Food	4,178	(2,177)	4,178	(2,239)	3,910	(1,831)	0.1878	0.0000
Alcohol	548	(749)	520	(755)	423	(676)	0.1860	0.0000
Clothing	1,584	(1,653)	1,564	(1,678)	1,352	(1,254)	0.1263	0.0000
Housing	10,032	(5,085)	10,096	(5,049)	8,233	(3,721)	0.6015	0.0000
Housing equipment	1,650	(4,090)	1,573	(3,468)	891	(1,672)	0.2474	0.0000
Health	1,244	(3,292)	851	(1,752)	707	(1,723)	0.0001	0.0000
Transport	5,027	(10,832)	5,341	(10,644)	3,783	(10,045)	0.2497	0.0235
Communication	886	(580)	980	(622)	1,072	(660)	0.0000	0.0000
Culture	3,476	(4,320)	2,995	(3,749)	2,265	(3,052)	0.0001	0.0000
Education	368	(1,187)	463	(1,298)	408	(880)	0.0001	0.0507
Restaurants	1,562	(2,121)	1,527	(2,471)	979	(1,798)	0.5374	0.0000
Other	3,760	(4,199)	3,491	(3,935)	2,436	(2,900)	0.0995	0.0000
Size	2.65	(1.27)	2.71	(1.25)	2.86	(1.20)	0.4303	0.0027
				Education				
Primary or lower	0.1716	(0.38)	0.1002	(0.30)	0.1480	(0.36)	0.0000	0.0000
Lower secondary	0.0915	(0.29)	0.1260	(0.33)	0.1851	(0.39)	0.0060	0.0126
Upper secondary	0.3870	(0.49)	0.2998	(0.46)	0.2505	(0.43)	0.0111	0.0000
Post-secondary	0.0694	(0.25)	0.0818	(0.27)	0.0451	(0.21)	0.0000	0.0000
Tertiary (1st stage)	0.2691	(0.44)	0.3716	(0.48)	0.3509	(0.48)	0.7861	0.0000
Tertiary (2nd stage)	0.0114	(0.11)	0.0205	(0.14)	0.0205	(0.14)	0.3206	0.8445
				Region				
NUTS 1	0.5020	(0.50)	0.6337	(0.48)	0.5679	(0.50)	0.1814	0.0104
NUTS 2	0.1334	(0.34)	0.1526	(0.36)	0.1623	(0.37)	0.0227	0.0038
NUTS 3	0.1625	(0.37)	0.1327	(0.34)	0.2032	(0.40)	0.0106	0.0000
NUTS 4	0.2021	(0.40)	0.0810	(0.27)	0.0666	(0.25)	0.0001	0.7409
				Population density				
High density	0.5118	(0.50)	0.6592	(0.47)	0.7163	(0.45)	0.0006	0.0000
Medium density	0.3732	(0.48)	0.2836	(0.45)	0.2522	(0.43)	0.0000	0.0000
Low density	0.1150	(0.32)	0.0572	(0.23)	0.0315	(0.17)	0.0000	0.0000

Table A2: (continued)

				Household type				
One adult	0.1950	(0.40)	0.1774	(0.38)	0.1026	(0.30)	0.0190	0.0011
Two adults	0.3045	(0.46)	0.2949	(0.46)	0.3383	(0.47)	0.0000	0.0000
> 2 adults	0.0641	(0.24)	0.0564	(0.23)	0.0408	(0.20)	0.0000	0.0000
One adult with children	0.0561	(0.23)	0.0403	(0.20)	0.0264	(0.16)	0.0000	0.0000
2 adults with children	0.3423	(0.47)	0.4103	(0.49)	0.4645	(0.50)	0.0000	0.0000
> 2 adults with children	0.0380	(0.19)	0.0208	(0.14)	0.0274	(0.16)	0.0000	0.0000
				Activity status				
Working	0.4300	(0.50)	0.4931	(0.50)	0.3361	(0.47)	0.0000	0.0012
Unemployed	0.0558	(0.23)	0.0907	(0.29)	0.1505	(0.36)	0.0001	0.0000
Retired	0.2223	(0.42)	0.1329	(0.34)	0.0617	(0.24)	0.0000	0.0000
Student	0.0673	(0.25)	0.0583	(0.23)	0.0834	(0.28)	0.0021	0.0033
Family work (unpaid)	0.0715	(0.26)	0.1527	(0.36)	0.2839	(0.45)	0.0000	0.0001
Disabled	0.1531	(0.36)	0.0723	(0.26)	0.0844	(0.28)	0.0008	0.0002

Source: Author's calculations.

Table A3: Summary statistics for France

	Natives		EU migrant		Non-EU migrant		t-test (p-values)	
	mean	SD	mean	SD	mean	SD	EU	Non-EU
Effective VAT	0.0913	(0.07)	0.1075	(0.11)	0.1021	(0.07)	0.0000	0.0000
hh income	44,460	(35,936)	39,013	(27,699)	47,530	(33,519)	0.0567	0.0000
Savings	10,775	(29,224)	6,900	(25,856)	9,099	(26,028)	0.0010	0.0000
hh expenditure	33,685	(20,140)	32,113	(21,688)	38,431	(21,427)	0.2174	0.0000
Expenditure rate	0.8846	(0.57)	1.0196	(1)	0.9306	(0.54)	0.0002	0.0000
			Expenditure type					
Food	5,544	(4,738)	4,901	(3,812)	5,886	(4,957)	0.0700	0.6204
Alcohol	867	(1,682)	828	(1,701)	861	(1,630)	0.1307	0.0000
Clothing	1,340	(1,829)	1,062	(1,606)	1,945	(2,127)	0.0146	0.0000
Housing	8,616	(4,393)	8,963	(4,582)	9,274	(5,243)	0.0000	0.0000
Housing equipment	1,664	(3,051)	1,568	(3,346)	1,833	(3,032)	0.6681	0.0017
Health	510	(981)	484	(855)	600	(1,096)	0.1242	0.0001
Transport	4,954	(7,667)	4,566	(7,786)	5,529	(7,920)	0.5512	0.0000
Communication	958	(651)	975	(654)	1,104	(741)	0.7343	0.0113
Culture	2,598	(3,832)	2,108	(2,739)	2,946	(3,881)	0.3946	0.0000
Education	233	(1,203)	332	(1,880)	242	(1,163)	0.3787	0.5643
Restaurants	1 904	(3,147)	2,014	(3,410)	2,673	(3,142)	0.0337	0.0000
Other	4,497	(4,139)	4,313	(5,870)	5,537	(5,723)	0.3496	0.0895
Size	2.52	(1.30)	2.52	(1.27)	3.93	(1.22)	0.0474	0.0000
			Education					
Primary or lower	0.0953	(0.29)	0.0603	(0.24)	0.0017	(0.04)	0.0000	0.0000
Lower secondary	0.1298	(0.34)	0.0419	(0.20)	0.0077	(0.09)	0.2574	0.0000
Upper secondary	0.2017	(0.40)	0.0938	(0.29)	0.0098	(0.10)	0.1429	0.0000
Post-secondary	0.1565	(0.36)	0.0911	(0.29)	0.0114	(0.11)	0.0102	0.0000
Tertiary (1st stage)	0.0795	(0.27)	0.0295	(0.17)	0.0049	(0.07)	0.1808	0.0000
Tertiary (2nd stage)	0.1068	(0.31)	0.1258	(0.33)	0.0140	(0.12)	0.0048	0.0000
Not spec.	0.2304	(0.42)	0.5577	(0.50)	0.9505	(0.22)	0.0648	0.0000
			Region					
Île-de-France	0.1664	(0.37)	0.3333	(0.47)	0.2023	(0.40)	0.0002	0.0000
Paris basin	0.1738	(0.38)	0.0925	(0.29)	0.1573	(0.36)	0.0000	0.0000
North – Pas-de-Calais	0.0611	(0.24)	0.0214	(0.15)	0.0606	(0.24)	0.0000	0.0000
East	0.0858	(0.28)	0.1162	(0.32)	0.0822	(0.27)	0.6683	0.0000
West	0.1318	(0.34)	0.0608	(0.24)	0.1232	(0.33)	0.0004	0.0000
South-east	0.1083	(0.31)	0.1115	(0.32)	0.0986	(0.30)	0.0927	0.0000
Centre-east	0.1202	(0.33)	0.1265	(0.33)	0.1084	(0.31)	0.0021	0.0000
Méditerranée	0.1248	(0.33)	0.1350	(0.34)	0.1272	(0.33)	0.6550	0.0000
Départements d'Outre-mer	0.0265	(0.16)	0.0028	(0.05)	0.0337	(0.18)	0.6430	0.0000

Table A3: (continued)

				Population density				
High density	0.4538	(0.50)	0.5219	(0.50)	0.4705	(0.50)	0.1927	0.0000
Medium density	0.1989	(0.40)	0.2339	(0.42)	0.1878	(0.39)	0.0521	0.0000
Low density	0.3473	(0.48)	0.2442	(0.43)	0.3417	(0.47)	0.0000	0.0000
				Household type				
One adult	0.2172	(0.41)	0.1750	(0.38)	0.0161	(0.13)	0.0336	0.0000
Two adults	0.3639	(0.48)	0.4149	(0.49)	0.0287	(0.17)	0.8234	0.0000
> 2 adults	0.0510	(0.22)	0.0513	(0.22)	0.0070	(0.08)	0.8250	0.0000
One adult with children	0.0485	(0.21)	0.0404	(0.20)	0.1391	(0.35)	0.0000	0.0000
2 adults with children	0.2897	(0.45)	0.2844	(0.45)	0.7753	(0.42)	0.0000	0.0000
> 2 adults with children	0.0296	(0.17)	0.0340	(0.18)	0.0339	(0.18)	0.9192	0.0000
				Activity status				
Working	0.4459	(0.50)	0.4745	(0.50)	0.2947	(0.46)	0.0652	0.0000
Unemployed	0.0601	(0.24)	0.0664	(0.25)	0.0465	(0.21)	0.0000	0.0000
Retired	0.3033	(0.46)	0.3203	(0.47)	0.0160	(0.13)	0.0000	0.0000
Student	0.1293	(0.34)	0.0416	(0.20)	0.0153	(0.12)	0.0051	0.0000
Family work (unpaid)	0.0377	(0.19)	0.0686	(0.25)	0.0450	(0.21)	0.0392	0.0000
Disabled	0.0236	(0.15)	0.0288	(0.17)	0.0076	(0.09)	0.0020	0.0000
Military or community service	0.0001	(0.01)	0.0000	(0.00)	0.5749	(0.49)	0.0000	0.0000

Source: Author's calculations.

Table A4: Summary statistics for Spain

	Natives		EU migrant		Non-EU migrant		t-test (p-values)	
	mean	SD	mean	SD	mean	SD	EU	Non-EU
Effective VAT	0.0868	(0.06)	0.0969	(0.06)	0.1153	(0.07)	0.0000	0.0000
hh income	33,265	(18,846)	26,346	(16,753)	22,380	(16,604)	0.0000	0.0000
Savings	-522	(14,752)	274	(14,110)	-2,207	(11,301)	0.4931	0.0000
hh expenditure	33,787	(19,128)	26,072	(14,456)	24,587	(15,570)	0.0000	0.0000
Expenditure rate	1.1012	(0.52)	1.1322	(1)	1.2989	(0.69)	0.0004	0.0000
			Expenditure type					
Food	4,965	(3,015)	3,836	(1,961)	3,761	(2,339)	0.0000	0.0000
Alcohol	738	(973)	1,006	(1,141)	512	(719)	0.0000	0.0000
Clothing	1,975	(2,844)	1,371	(1,877)	1,692	(2,234)	0.0000	0.0000
Housing	9,501	(5,291)	7,888	(4,260)	7,232	(3,699)	0.0000	0.0000
Housing equipment	1,650	(2,727)	1,021	(1,485)	995	(3,486)	0.0000	0.0000
Health	1,055	(2,800)	752	(3,463)	472	(1,824)	0.0003	0.0000
Transport	4,440	(6,544)	3,265	(3,938)	3,424	(3,943)	0.0000	0.0000
Communication	1,028	(740)	1,042	(871)	1,009	(941)	0.4250	0.0623
Culture	2,147	(3,121)	1,510	(2,112)	1,360	(1,943)	0.0000	0.0000
Education	437	(1,348)	242	(952)	317	(1,209)	0.0000	0.0000
Restaurants	3,250	(3,997)	2,312	(2,947)	2,209	(3,259)	0.0000	0.0000
Other	2,600	(3,090)	1,828	(2,419)	1,603	(1,978)	0.0000	0.0000
Size	3.20	(1.23)	2.96	(1.22)	3.81	(1.54)	0.3568	0.0000
			Education					
Lower than primary	0.0158	(0.12)	0.0023	(0.05)	0.0205	(0.14)	0.0000	0.0000
Primary	0.1917	(0.39)	0.0891	(0.29)	0.1287	(0.33)	0.4293	0.4203
Secondary	0.2656	(0.44)	0.2513	(0.43)	0.2732	(0.45)	0.0000	0.0000
Post-secondary	0.1532	(0.36)	0.2943	(0.46)	0.2237	(0.42)	0.0004	0.0000
Tertiary	0.2149	(0.41)	0.2307	(0.42)	0.1626	(0.37)	0.0000	0.0000
Not spec.	0.1588	(0.37)	0.1322	(0.34)	0.1913	(0.39)	0.0000	0.6770
			Region					
North-west	0.1035	(0.30)	0.0348	(0.18)	0.0334	(0.18)	0.5520	0.0071
North-east	0.0985	(0.30)	0.0681	(0.25)	0.0693	(0.25)	0.9493	0.0000
Madrid	0.1305	(0.34)	0.1669	(0.37)	0.2008	(0.40)	0.0691	0.0000
Centre	0.1290	(0.34)	0.0877	(0.28)	0.0601	(0.24)	0.0001	0.0000
East	0.2754	(0.45)	0.3792	(0.49)	0.4148	(0.49)	0.0391	0.0025
South	0.2192	(0.41)	0.1983	(0.40)	0.1674	(0.37)	0.4740	0.0161
Canarias	0.0438	(0.20)	0.0651	(0.25)	0.0540	(0.23)	0.0179	0.0000
			Population density					
High density	0.5091	(0.50)	0.4725	(0.50)	0.6182	(0.49)	0.1702	0.8212
Medium density	0.2289	(0.42)	0.2495	(0.43)	0.2080	(0.41)	0.0000	0.0013
Low density	0.2620	(0.44)	0.2780	(0.45)	0.1738	(0.38)	0.0000	0.0000

Table A4: (continued)

				Household type				
One adult	0.0723	(0.26)	0.0835	(0.28)	0.0422	(0.20)	0.0000	0.0000
Two adults	0.2162	(0.41)	0.2824	(0.45)	0.1603	(0.37)	0.0001	0.0670
> 2 adults	0.2075	(0.41)	0.1475	(0.35)	0.1545	(0.36)	0.0031	0.0507
One adult with children	0.0211	(0.14)	0.0098	(0.10)	0.0276	(0.16)	0.0588	0.0000
2 adults with children	0.3690	(0.48)	0.3817	(0.49)	0.3735	(0.48)	0.0483	0.0171
> 2 adults with children	0.1126	(0.32)	0.0951	(0.29)	0.2385	(0.43)	0.0176	0.0000
Other	0.0013	(0.04)	0.0000	(0.00)	0.0033	(0.06)	0.3396	0.0161
				Activity status				
Working	0.3911	(0.49)	0.4525	(0.50)	0.4589	(0.50)	0.0920	0.0000
Unemployed	0.1036	(0.30)	0.1476	(0.35)	0.1883	(0.39)	0.0018	0.0000
Retired	0.1536	(0.36)	0.1362	(0.34)	0.0153	(0.12)	0.0000	0.0000
Student	0.0616	(0.24)	0.0409	(0.20)	0.0481	(0.21)	0.9066	0.2808
Family work (unpaid)	0.1095	(0.31)	0.0749	(0.26)	0.0835	(0.28)	0.0000	0.0000
Disabled	0.1584	(0.37)	0.1322	(0.34)	0.1907	(0.39)	0.8570	0.0000
Military or community service	0.0222	(0.15)	0.0156	(0.12)	0.0152	(0.12)	0.0542	0.0000

Source: Author's calculations.

Table A5: Additional regressions, France

	(1)	(2)	(3)	(4)
	eVAT	eVAT	eVAT	eVAT
Migration status (ref. native)				
EU migrant	0.006	0.001	0.008	0.006
	(1.63)	(0.42)	(2.11)*	(1.83)
Non-EU migrant	0.011	0.005	0.013	0.012
	(8.20)**	(7.40)**	(9.21)**	(9.13)**
hh income	-0.003	-0.001	-0.005	-0.005
	(20.98)**	(6.69)**	(42.11)**	(20.82)**
hh income^2	0.000	0.000	0.000	0.000
	(14.01)**	(7.52)**	(20.80)**	(11.43)**
hh income^3	-0.000	-0.000	-0.000	-0.000
	(9.94)**	(7.06)**	(19.38)**	(3.70)**
hh income^4	0.000	0.000	0.000	-0.000
	(8.87)**	(6.78)**	(18.69)**	(4.32)**
hh expenditure	0.002	0.000	0.004	0.006
	(21.03)**	(5.35)**	(36.47)**	(37.05)**
Spending status (ref. high)				
Low	-0.078			
	(31.91)**			
Low-medium	-0.073			
	(41.43)**			
Medium	-0.065			
	(43.47)**			
Medium-high	-0.056			
	(39.07)**			
Expenditure rate		0.109		
		(33.90)**		
Interactions				
hh income * expenditure			-0.000	-0.000
			(11.26)**	(13.36)**
hh income^2 * expenditure				0.000
				(7.75)**
hh income^3 * expenditure				-0.000
				(7.72)**
hh income^4 * expenditure				0.000
				(8.30)**
Constant	0.194	0.008	0.137	0.114
	(68.39)**	(2.24)*	(57.21)**	(25.01)**
Add. controls	yes	yes	yes	yes
R-squared	0.62	0.89	0.61	0.63
R-squared adj.	0.62	0.89	0.61	0.63
RMSE	0.0445	0.0244	0.0451	0.0437
Observations	40,762	40,762	40,762	40,762

Note: * $p < 0.05$; ** $p < 0.01$.
Source: Author's calculations.

Table A6: Additional regressions, Germany

	(1) eVAT	(2) eVAT	(3) eVAT	(4) eVAT
Migration status (ref. native)				
EU migrant	0.002	0.003	0.002	0.002
	(1.62)	(4.52)**	(2.01)*	(3.03)**
Non-EU migrant	0.001	0.005	0.002	0.003
	(1.11)	(7.37)**	(2.28)*	(4.82)**
hh income	-0.006	-0.002	-0.009	-0.011
	(32.61)**	(25.45)**	(52.06)**	(61.62)**
hh income^2	0.000	0.000	0.000	0.000
	(18.36)**	(12.34)**	(31.34)**	(43.51)**
hh income^3	-0.000	-0.000	-0.000	-0.000
	(12.72)**	(5.29)**	(21.64)**	(32.85)**
hh income^4	0.000	0.000	0.000	0.000
	(9.70)**	(2.28)*	(16.66)**	(26.19)**
hh expenditure	0.002	0.001	0.005	0.010
	(39.32)**	(18.58)**	(77.82)**	(63.51)**
Spending status (ref. high)				
Low	-0.049			
	(31.43)**			
Low-medium	-0.052			
	(50.70)**			
Medium	-0.047			
	(56.90)**			
Medium-high	-0.039			
	(52.39)**			
Expenditure rate		0.107		
		(65.72)**		
Interactions				
hh income * expenditure			-0.000	-0.000
			(33.77)**	(34.27)**
hh income^2 * expenditure				0.000
				(20.32)**
hh income^3 * expenditure				-0.000
				(8.84)**
hh income^4 * expenditure				-0.000
				(1.33)
Constant	0.216	0.037	0.187	0.151
	(87.44)**	(19.25)**	(88.54)**	(71.39)**
Add. controls	yes	yes	yes	yes
R-squared	0.69	0.87	0.76	0.83
R-squared adj.	0.69	0.87	0.76	0.83
RMSE	0.0315	0.0203	0.0279	0.0231
Observations	122,373	122,373	122,373	122,373

Note: * $p < 0.05$; ** $p < 0.01$.
Source: Author's calculations.

Table A7: Additional regressions, Spain

	(1) eVAT	(2) eVAT	(3) eVAT	(4) eVAT
Migration status (ref. native)				
EU migrant	0.007	0.009	0.008	0.010
	(5.77)**	(14.32)**	(8.01)**	(11.27)**
Non-EU migrant	0.012	0.012	0.014	0.014
	(11.24)**	(25.60)**	(14.89)**	(19.37)**
hh income	-0.008	0.001	-0.009	-0.012
	(30.68)**	(10.83)**	(23.18)**	(44.28)**
hh income^2	0.000	-0.000	0.000	0.000
	(21.26)**	(9.60)**	(11.33)**	(29.42)**
hh income^3	-0.000	0.000	-0.000	-0.000
	(16.98)**	(7.93)**	(6.29)**	(19.60)**
hh income^4	0.000	-0.000	0.000	0.000
	(13.96)**	(6.80)**	(4.34)**	(13.80)**
hh expenditure	0.003	0.000	0.005	0.010
	(42.53)**	(2.44)*	(44.33)**	(56.44)**
Spending status (ref. high)				
Low	-0.018			
	(10.73)**			
Low-medium	-0.024			
	(20.12)**			
Medium	-0.025			
	(28.70)**			
Medium-high	-0.023			
	(35.76)**			
Expenditure rate		0.100		
		(100.31)**		
Interactions				
hh income * expenditure			-0.000	-0.000
			(15.32)**	(27.35)**
hh income^2 * expenditure				0.000
				(13.80)**
hh income^3 * expenditure				-0.000
				(3.41)**
hh income^4 * expenditure				-0.000
				(4.13)**
Constant	0.141	-0.038	0.119	0.096
	(55.42)**	(21.75)**	(34.89)**	(40.46)**
Add. controls	yes	yes	yes	yes
R-squared	0.66	0.89	0.73	0.82
R-squared adj.	0.66	0.89	0.73	0.82
RMSE	0.0334	0.0188	0.0299	0.0246
Observations	62,245	62,245	62,245	62,245

Note:* $p < 0.05$; ** $p < 0.01$.
Source: Author's calculations.