Does migration affect tax revenue in Europe?

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This paper analyses the effects of migration on per capita collected tax revenues. The panel data used includes 25 European Union (EU) countries and covers the period 1996-2010. The research contributes to the debate linking migration and tax, and finds evidence that net migration is a significant factor explaining tax revenues. In the case of EU countries, net migration accelerates to some extent the rise in collected tax, and strongly impacts on the level of tax revenues available per capita.

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Abstract

This paper analyses the effects of migration on per capita collected tax revenues. The panel data used includes 25 European Union (EU) countries and covers the period 1996-2010. The research contributes to the debate linking migration and tax, and finds evidence that net migration is a significant factor explaining tax revenues. In the case of EU countries, net migration accelerates to some extent the rise in collected tax, and strongly impacts on the level of tax revenues available per capita.

1. Introduction

In periods of economic stagnation, when pull factors for cross-border mobility are subsiding, the public debate surrounding immigration becomes paradoxically more acrimonious. Yet, given the strains of economic austerity, a question deserving academic scrutiny is the impact of immigration on public finances. Common concerns related to migration in receiving economies remain the effects on job prospects and natives' unemployment, coupled with the cost of providing public services for an expanding population. On the other hand, as migrants are a significant group of workers in a variety of industries they support budgetary revenues, through tax and other types of contributions. Migrants' typical characteristics also make them good candidates for paying more into taxation than what they withdraw in health or welfare spending. They tend to be younger than the average population, and temporary migrants return to their country of origin before reaching pensionable age. Non-natives' access to welfare can be furthermore restricted by explicit clauses of no access to public funds or limited entitlement to public services[1]. In instances where migrants have an informal status in the host economy this further disqualifies them from the constitutional rights available to the average citizen, or fiscal transfers.

While the traditional literature in the field explores primarily how taxation determines migrant flows (e.g. Simula and Trannoy, 2010), our study proposes to analyse the opposite effect, looking at the implications of migration on government tax inputs and revenue. In light of the difficulties experienced by national budgets, a positive contribution to government revenue through migration would be welcome. To the contrary, should tax revenue per capita decrease with immigration, we might document a justification for migration restrictions within a package of austerity measures. In sum, by analysing the fiscal impact of migration from a tax revenue perspective, we endeavour to enhance the migration policy debate in times of economic hardship.

We further consider per capita tax revenue as a source of government income potentially benefitting the average individual in countries of immigration. We acknowledge that where complementarity rather

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[1] UK visa holders, for example, typically have a 'no recourse to public funds' condition attached to their legal stay in the country, and there are plans to restrict migrants' access to public services, including the national health system. See also Boeri, T., Hanson, G.H., McCormick, B., Fondazione Rodolfo Debenedetti., 2002. Immigration policy and the welfare system: a report for the Fondazione Rodolfo Debenedetti. Oxford University Press, Oxford.

than substitution with native workers dominates the labour market effect of immigration, there is an addition to the working age population. That potentially mitigates the burden of increasing dependency ratios, and allows for higher per capita tax revenues. Such revenues further increase where migrants contribute more tax than the average working population, but also where migration induces revenues from all taxes to rise. In this paper we shall observe the aggregate tax revenue effects.

While concentrating on the implications of migration on budgetary revenues, we also introduce a brief discussion of the related process of tax collection, as influenced by immigration. We thereby extend the academic discussion (see Rowthorn, 2008 for a synthesis) that concentrates on welfare effects and benefits withdrawal by migrants and question the mechanism by which tax payments are constructed in the case of non-native workers. The incentives for tax payment are thus re-evaluated in a constitutional framework complemented by an open economy perspective, accommodating the cross-border mobility of individuals.

Ultimately, we estimate the effects of immigration on the collected tax revenue in European countries across a period of 15 years, between 1996 and 2010, controlling for a series of internal and external dimensions of individual economies. The panel data covers 25 EU countries. We choose the EU, as member states have been recently affected by significant migration flows, enhanced by the expansion of the single market in Europe. At the same time, as EU countries are confronted with severe budgetary constraints, any factors that contribute to an increase in average tax revenue would mean a potential reduction in the shared public debt burden, and a welcome relief from protracted austerity.

The rest of the paper is structured as follows: Section 2 presents the role of tax from the point of view of mobility and locational advantage, and reviews the welfare effects of migration as reflected in the existing economic literature. Section 3 focuses on the decision to pay tax by introducing a new open-economy perspective, which discusses migrants' incentives to contribute to host countries' budgetary revenues. The methodology and data are presented in Section 4, and the main results are discussed in Section 5; Section 6 concludes.

2. From locational choice to welfare effects of migration

The design of taxation systems needs to consider the possibility of individuals voting with their feet, under the condition that migration is feasible between tax jurisdictions (Mirrlees, 1982). In an international context, restricted movement across borders means that locals often have little choice but to accept the national tax regime. Yet, with accelerated economic integration and an increasing single market in Europe, the relevance of tax-competition with mobile labour translates easier to the supra-national level (Wilson, 1992). Net migration can be the outcome of emigration of the native population shopping for the most advantageous tax regime (Simula and Trannoy, 2010), as well as being the result of immigration responding to tax incentives. Thus, we could expect lower taxes with mobile labour, due to increased competition between alternative locations. Still, such effects are to be quantified empirically, as low tax rates can induce higher tax collection, with an ambiguous final outcome for tax revenues. As tax revenues represent the focus of the present research, we have to discount the interaction between tax rates and locational decisions of mobile individuals. In practical terms this means that our empirical work needs to ensure that while considering how migration impacts on tax revenue, we pay attention to the potential endogeneity of variables in any test of a relationship between migration and tax.

A further part of the existing literature has as primary interest the impact of international openness on national budgetary revenues. The opening of borders can arguably increase the vulnerability of sections of the native population, a process which calls for a larger state and public budgets. Yet, Dreher (2006) shows that the evidence is generally inconclusive in terms of what effect we can expect on the final tax revenue, from globalisation. Such evidence also relates economic openness with flows of goods and capital mobility, rather than labour migration. Openness relying on capital flows can be interpreted in this context as a means to trigger an increase in the level of international investment and capital taxation. The present study emphasises the role of migration for tax collection, while capital inflows and trade are introduced in our empirical work as controls within the open economy framework of the analysis. Overall, we hope to disentangle the way in which individual factor movements influence the aggregate

revenue from collected tax, and thus add to the debate on the effects of external pressures on national economies, with migration as a significant factor.

Most frequently, international migration is scrutinised for its potential impact on rising fiscal transfers. The literature on the welfare effect of migration thus considers the significance of net transfer payments to foreign nationals residing within a tax jurisdiction. The related research question asks to what extent migrants are attracted by 'welfare magnets'. Under this perspective, the migrant flow can be geared by the prospect to withdraw resources from the destination country welfare system. The evidence in this direction is mixed. Borjas (1999) shows, for example, that in the United States more generous states tend to be more attractive locations for foreign nationals. Others, focusing on the OECD (e.g. Belot and Ederveen, 2012) find no evidence of the attractiveness of more generous welfare systems to migrants. There are also differences in the estimated outcomes of migration on welfare payments in the short and in the long term. In this context, a moderate rise in transfers is linked to migration from pre-enlargement European Union countries to the rest ot the EU (De Giorgi and Pellizzari, 2009). Empirical evidence (e.g. Boeri et al., 2002; Gaston and Rajaguru, 2013; Vargas-Silva, 2013) further indicates that differences between countries in terms of transfers benefitting migrants are linked to welfare system design and individual socio-economic characteristics of migrants. These characteristics typically relate to skills or education of migrants, rather than any inherent preference for higher welfare claims in the migrant population. Lending support to this observation, Dustmann et al. (2010) assess the fiscal impact of recent migrants to the UK and show that after controlling for individual characteristics migrants have a 13% lower propensity to access benefits compared to similar natives.

Rowthorn (2008) surveys various channels by which migration contributes a fiscal impact, differentiating for the demographic characteristics of migrants, their length of stay abroad, as well as the mechanisms by which immigration interacts with natives' mobility and the general provision of public goods. The resulting net fiscal impact of migration on developed economies is estimated to fall in the range of ±1% of GDP. Unskilled migrants who settle abroad are expected to impose a cost on natives, and displacement of the local population in areas of immigration can reverse the positive contributions of migration, including the available tax revenues. However, non-nationals often

represent a significant contribution to the skilled workforce (Hunt, 2004), with positive consequences to productivity, economic activity and tax revenues (Bhagwati and Hanson, 2009).

Razin et al. (2002) further show that tax rates decline with unskilled migration - as the native population is trying to avoid transfers that benefit unskilled migrants. Any disproportionate benefit to migrants hinges on individual characteristics, rather than their migrant status. Based on this reasoning, where migrants are skilled they contribute more in tax and immigration induces the opposite effect in the local population. We could thus experience an increased support for higher tax rates in the presence of migration.

To sum up, the literature linking welfare and migration focuses on the usage of public services and social benefits by migrants, and looks at natives' preferences for taxation. What it does not take into account are the motives of migrants to pay tax. We propose to concentrate in this paper on the inputs side of the welfare equation, before it translates into budgetary revenues. Thereby we wish to explore an aspect which is less developed in the literature - the migrants' decision to pay tax.

Overall, there is no evidence that migrants have stronger preferences for welfare support compared to the local population. As such, the tax revenue that they generate should not benefit them disproportionally at the stage of redistribution. The aggregate impact of migration on tax revenue becomes unclear, and should benefit from its empirical exploration proposed in this paper. We discuss next some potentially relevant aspects about the environment in which migrants decide to make their tax contributions abroad.

3. The Decision to Pay Tax Extended to Non-Nationals

We proceed from the individual motivation to pay taxes, based on a classical utility calculation and contingent on the option to evade taxation. The perspective emerging from the public choice literature starting with Brennan and Buchanan (1980) is that taxpayers make their contributions in order to secure their constitutional rights and the availability of public goods. When it comes to the rights of nationals versus non-nationals, there might be considerable differences between the two groups and implicitly, in their incentives to pay tax. An underlying model for tax payment was initially proposed by

Allingham and Sandmo (1972), and incentives for tax evasion have been reconsidered recently by Epstein and Gang (2010). The model looks at the individual utility of income after tax and the utility of tax evasion - subject to the probability of being discovered.

Related to the characteristics of the population, rising educational levels are associated with better collection of income tax - as better literacy increases the acknowledgement of rights and duties within a constitutional framework (Kenny, 2006). From a different perspective, tax morale has been previously shown to decrease with ethnic diversity (Lago-Peñas and Lago-Peñas, 2010). Existing studies do not differentiate between natives and non-natives as taxpayers, but we would like to explore such possible divergence, taking into account the different ways in which these two groups can benefit from tax.

Migrants' links to their home economies are constructed through social networks, and consolidated by remittances. For example, recent European evidence indicates a tendency for migrants to be employed abroad in occupations below their skill level (NIER, 2010). A justification for them accepting the relatively lower position in the income distribution abroad compared to their home economy are the strong links that they maintain to the country of origin. The latter remains the reference point for migrants in terms of socio-economic status (Hiris, 2008). Related to such links, the potential to design migrants' tax payments towards the home country has been also long discussed in the economic literature (Bhagwati and Hamada, 1982). Yet, such payments are not easily enforced in practice. We evidence instead the substitution of potential home country tax payments with remittances to family and friends and savings towards future goods and services to be consumed upon a migrant's own return. In conclusion, the country of origin rather than that of destination serves as migrants' *socio-economic jurisdiction,* with a weakening of any tax payment mechanisms operating according to a constitutional framework.

We would also like to move from the individual propensity to pay or avoid taxes to considerations related to the aggregate tax collection, as tested in our empirical analysis detailed in section 4. An aspect that gains relevance in a framework with different types of taxpayers is the possibility of individuals to be hidden from the formal economy. In countries with large shares of the informal sector we can also assume that legal enforcement is relatively weak, making it easier to avoid the tax system

and induce lower tax revenues.[2] Should the informal sector be relevant to the employment of any significant proportion of non-natives, the latter can be excluded from tax contributions while having limited access to welfare transfers and public provision of services. Coupled with a lack of voting rights and no allegiance to the constitutional state at destination, we faced overall decreased incentives to pay tax by non-nationals.

In sum, we can expect a lower propensity to pay tax in the presence of migration, in line with the utilitarian framework and the restricted relevance of constitutional rights where migrants reside temporarily abroad. Our investigation of how migration impacts on tax revenues in destination countries attempts to settle the question of whether migration is detrimental to the aggregate level of collected tax, or whether tax revenues can be raised in spite of a higher theoretical propensity of migrants to avoid tax compared to the native population. We also add to earlier empirical research on tax contributions by migrants undertaken by Dustmann et al. (2010) in a single country context, and which built on individual data on native versus foreign labour. The next two sections construct the empirical framework to evaluate tax revenue effects of migration across various EU countries and over an extended period of time.

4. Data and methodology

Going out from the various links between taxation and migration discussed so far, we hypothesis as valid the influence of migration on the level of collected tax revenues. In order to investigate the impact on government collected tax revenues in the case of EU member states, we propose a panel model approach, with an unbalanced sample that includes 25 countries, for the period 1996-2010. As some relevant data-series are not available for Luxemburg and Malta, these EU countries have been excluded from the dataset for the selected period.

In the most generic format, two variables capture our hypothesised relationship between collected tax revenues and migration: the tax inputs, as dependent variable, and migration, as independent variable.

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[2] On the significance of the informal sector in various countries see for example Buehn, A., Schneider, F., 2012. Shadow Economies around the World: Novel Insights, Accepted Knowledge, and New Estimates. International Tax and Public Finance 19, 139-171.

Tax inputs are expressed here using two variables: *tax revenues per capita*, and the *change in tax revenues per capita* - as a percentage change in revenues between two subsequent years. Tax revenues reflect the level of tax collected by general government, in millions of U.S. dollars. The choice we make for our variables format allows to check for robustness, as well as to correct for the endogeneity of migration with respect to tax inputs. More precisely, given our intention to test the influence of migration on tax revenue we attempt to deal with the endogeneity determined by any reverse causality between tax and migration. We first perform classical panel OLS estimations, with the change in tax revenues per capita as dependent variable. We further use generalised methods of moments (GMM) estimations, in both dynamic and system formats, with tax revenues per capita as dependent variable. Our variable of interest is represented by the rate of net migration. More precisely, the indicator is constructed as the ratio of net migration (i.e. immigration minus emigration) plus statistical adjustments during a year[3] and the total population, and is expressed per 1000 inhabitants. While in terms of a potential evaluation of tax contributions it might be more interesting to consider the effect of gross rather than net migration, the data availability for gross flows is weak. We shall focus here on collected tax revenues available per capita, and discuss them as budgetary sources influenced by net migration. We enter a set of control variables to better isolate the effect of migration. The controls include: the balance of trade, net foreign direct investments (FDI), the budget balance, government effectiveness, the level of education in the destination country population, and the share of the shadow economy in total output. The balance of trade reveals the difference between the monetary value of exports and imports, relative to the gross domestic product (GDP). The positive influence of this variable on tax revenues is evidenced by Rodrik (1998) and Gupta (2007). The second control variable is net FDI and measures the difference between inward foreign direct investment and outward foreign direct investment, relative to GDP. A positive impact of net FDI on tax revenues is expected, according to earlier evidence in Huizinga and Nicodème (2006). The budget balance represents the difference between government revenues and spending, again as a fraction of GDP. A recent investigation of the

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[3] The statistical adjustment illustrates the difference between the total change in the population and the natural change of the population.

budget balance-tax revenue nexus pertains to Hirshman (2011), and in line with its findings we also expect that the budgetary balance is directly related to tax revenue.

The fourth control variable is government effectiveness, which captures the perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies. (Within the indexes constructed for this variable -2.5 shows a weak governance performance, while 2.5 shows a strong governance performance). The significant positive impact of government effectiveness on collected tax revenues is evidenced by Hanousek and Palda (2004) and Lisi (2011).

The fifth control variable that we use relates to the education level of the population. This variable has been compiled as the share of medium plus higher educated in the total population of individual countries. Notable empirical work in this area has been undertaken as well by Torgler (2003), who finds a higher level of tax collection in the case of countries with higher levels of education.

The last control variable considered relates to the shadow economy relative to GDP. According to Feige (1989, p.1), it represents 'those economic activities and the income derived from them that circumvent or otherwise evade government regulation, taxation or observation'. Frey and Schneider (2000) confirm, for example, that the shadow economy has a negative impact on tax revenues.

In the Appendix, Table A.1 shows the sources of data used for all variables, while Table A.2 presents the descriptive statistics. As multicolliniarity between our variables could be an issue, the variance inflation factor (VIF) test is performed, including the different specifications for the dependent variable considered. (See Table A.3 in the Appendix.)

In a first scenario, where we consider the *change in tax revenues per capita* as the dependent variable (τ'), the equation to be estimated is described by:

$$\tau'_{it} = \alpha + \alpha_0 \tau'_{it-1} + \beta_0 \eta_{it} + \sum_{k=1}^{n} \beta_k X_{k,it} + \phi_i + \mu_t + \varepsilon_{it}, \qquad \text{Eq. (1)}$$

We consider tax revenue changes for county i and period t, α is the intercept, α_0 represents the coefficient of the lagged value of tax revenue, β_0 is the coefficient for migration (η), β_k are the coefficients of our k control variables, X is the vector of control variables, while ϕ_i and μ_t are country-specific and time-specific fixed effects and ε_{it} is the error term.

Two models are performed in this case: a naive OLS model and an extended OLS model, which includes all control variables. Additionally, as the panel estimation may be affected by heterogeneity in the data, we test for this in both the cases of fixed and random-effects models. First, we undertake an F test to choose between the pooled OLS model and the fixed effects model. We proceed next with a Hausman test, in order to compare the fixed effects and the random effects models.

Our second scenario takes into account *tax revenues per capita* as the dependent variable (τ''), and these are entered in logarithmic form. In this case, the causality can run in both directions - from migration to tax revenues and vice versa - inducing an endogeneity issue, where the regressor may be correlated with the error term. This assumption can be validated on the basis of the Durbin-Wu-Hausman (DWH) test of endogeneity. In order to deal with this issue in our estimations, we use in a first step the Arellano-Bond (1991) first-difference GMM estimator. Our estimation equation becomes:

$$\Delta \ln(\tau''_{it}) = \alpha + \alpha_0 \Delta \ln(\tau''_{it-1}) + \beta_0 \Delta \eta_{it} + \sum_{k=1}^{n} \beta_k \Delta X_{k,it} + \Delta \mu_t + \Delta \varepsilon_{it}, \qquad \text{Eq. (2)}$$

Besides fixing the endogeneity issue for the migration variable η, the dynamic GMM estimator addresses two further estimation issues: the correlation of a time-invariant country effect with further explanatory variables, and the autocorrelation generated by a lagged dependent variable. Another argument for the Arellano-Bond estimator is that it is performed for small T and large N panels, as applicable in our case (T=15 and N=25). We have used the lags of the endogenous variable η as a main instrument for the estimation and added the GDP growth rate as an additional instrument. The GDP growth rate can be a good proxy for migration, as noted by Alvarez-Plata et al. (2003).

The Arellano-Bond dynamic GMM model could lead to weak estimations, as the lagged level of the regressors are poor instruments for the first-differenced regressors. In this context, we performed an augmented version, named 'system GMM', and introduced by Blundell and Bond (1998). This kind of estimation uses the levels of variables, as in equation (2), for obtaining a system of two equations: one differenced and one in levels.

In both cases of GMM estimators, the Sargan test is performed to check the validity of the instrumental variables considered, while the tests for AR(1) and AR(2) processes in first differences are used to investigate the presence of autocorrelations.

The next section illustrates the main empirical results for the various models that we considered, with the change in tax revenues per capita and the (ln) tax revenues per capita as alternative dependent variables.

5. Empirical results

Before performing the main estimations based on the proposed equations, an investigation of potential multicolliniarity between regressors is required. We consider for this purpose the variance inflation factor (VIF) test, applied in relation to both formats of our dependent variable: the *change in tax revenues per capita* and (*ln) tax revenues per capita*. The values of the VIF and the mean values of the VIF tests, as shown in Table A.3 in the Appendix are less than 4 (with one exception, which is at the limit, i.e. government effectiveness). We conclude that multicolliniarity between regressors is not an issue in this case. (See as well O'Brien, 2007.)

Table 1 illustrates the estimation results from various models considered for both our proposed scenarios, using *the change in tax revenues* per capita and (*ln) tax revenues per capita* as dependent variables.

Table 1 - The estimation results

Dependent variable:	Change in tax revenues per capita				Ln of tax revenues per capita in US $	
Independent variables	Model					
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	0.044*** (0.007)	-0.026 (0.074)	0.7102 (0.476)	-0.026 (0.0703)		2.316*** (0.689)
Rate of net migration plus statistical adjustment	0.0102*** (0.001)	0.002* (0.001)	0.005* (0.003)	0.002* (0.001)	0.077*** (0.024)	0.069*** (0.012)
Balance of trade		-0.144 (0.137)	0.5304* (0.302)	-0.144 (0.129)	-2.570* (1.545)	-0.283 (0.278)
Net FDI		0.085 (0.126)	0.019 (0.143)	0.085 (0.119)	0.171 (0.487)	-0.012 (0.274)
Budget balance		0.132 (0.256)	-0.966** (0.406)	0.132 (0.242)	0.305 (1.366)	1.172** (0.578)
Government effectiveness		-0.024 (0.0208)	0.041 (0.048)	-0.024 (0.019)	-0.554** (0.231)	0.0608 (0.058)
Share of medium and higher educated population		0.1405** (0.059)	0.549* (0.319)	0.1405** (0.055)	3.936** (1.560)	0.727*** (0.157)
Shadow economy		0.072 (0.169)	- 4.874*** (1.363)	0.072 (0.1601)	- 26.048*** (8.728)	-1.197*** (0.450)
Lag of Change in tax revenues		0.536*** (0.064)	0.317*** (0.0705)	0.536*** (0.061)		
Lag of ln of tax revenues/capita (in US$)					-0.475 (0.430)	0.6905*** (0.077)

Diagnostics						
Type of estimation	PLS	PLS	PLS FE	PLS RE	GMM dynamic	GMM system
R-squared	0.191	0.419	0.543	0.419		
F-test for fixed effects			2.0073 (0.0055)			
Hausman test				47.218 (0.000)		
Durbin-Wu-Hausman chi-sq test					7.26090 [0.0070]	
Ar(1)					1.09 [0.276]	-0.85 [0.397]
Ar(2)					-0.92 [0.355]	-1.00 [0.317]
Number of instruments					18	25
Sargan probability					0.87	0.151

[a] (…) denotes the standard error.

[b] […] denotes the probability.

[c] PLS represents panel least squares.

[d] FE and RE denote fixed-effects, respectively random-effects.

[e] ***, **, and * denote significance at 1%, 5% and 10 % level of significance, respectively.

The main results reveal that in all scenarios the rate of net migration η is significant and positively correlated with our dependent variable, as expressed in both its formats.

In the first scenario, which uses the *change in tax revenues per capita* as dependent variable, the naive OLS model (1) illustrates that migration is significant and has a positive sign with respect to tax revenue. After entering control variables, as shown in model (2), migration remains significant and has the same

positive sign. Amongst our set of control variables, only the share of medium and higher educated population is significant, having a positive sign.

Further, we initiate the hypothesis tests to choose between pooled model and fixed-effects model. The value of the F-test for fixed-effects denotes that the country fixed-effects model (3) is preferred to the OLS estimations. Applying the Hausman-test in the case of the random effects model (4) we find that the fixed-effects model (3) is more appropriate than the random-effects model 4. Moreover, as the number of cross-sections is greater than the period of analysis (N>T), the preference for fixed-effects is reinforced.

In our preferred model (3), the migration variable is still significant and positively correlated with the change in tax revenues per capita. The other determinants are also significant, with the exception of net FDI and government effectiveness. The balance of trade and the share of medium and higher educated population have the expected positive sign, while the budget balance and the shadow economy indicator are negatively correlated with the dependent variable. The effect of the budgetary balance could be the result of lower taxes being required where deficits are lower or the budgetary balance improves, and the negative contribution of the shadow economy to tax revenues is in line with expectations. In terms of the marginal effects of migration, these results reveal that a 1 point increase in the rate of net migration plus statistical adjustments induces a 0.5% points acceleration of the rise in tax revenues per capita.

The second scenario takes into account the *ln of tax revenues per capita* as dependent variable. The endogeneity issue of net migration rates with respect to the dependent variable is validated by the Durbin-Wu-Hausman chi-square test. According to the test results, the null hypothesis that the regressor is exogenous can be rejected. The instruments used to deal with this issue are lagged values of the endogenous variable η (from 6 to 7 lags), and the GDP growth rate - as an additional instrument. In both types of GMM estimations - dynamic and system – net effects of migration rates as our variable of interest are conclusive, the variable registering a positive sign. The dynamic GMM results allow us to further check the effects of control variables. In two cases, the variables' coefficients are not significant (i.e. net FDI and budget balance). The balance of trade, government effectiveness and the share of the shadow economy are negatively correlated with our dependent variable, the first two

remaining rather puzzling. Only the share of the medium and higher educated population variable has a positive sign. Finally, the GMM system outputs clearly reveal that net migration rates are significant, with a positive impact on our dependent variable, the tax revenue. In this case, the control variables balance of trade, net FDI and government effectiveness are not conclusive. The shadow economy is significant and has negative sign. Budget balance and the share of medium and higher educated population have conclusive effects and are positively correlated with the dependent variable.

In terms of specific effects of migration, the results illustrate that a 1 point increase in the rate of net migration determines an increase of around 0.07 in the ln of per capita collected tax revenue. In other words, a 1 point higher rate of net migration determines the level of per capita collected tax revenue to be a significant 7% higher.

The Sargan test results indicate for both GMM estimations considered that the instruments are valid (i.e. the instruments are not correlated with the errors in the first-differenced equation). At the same time, the outputs of tests for AR(1) and AR(2) processes in first differences do not find any evidence of autocorrelations.

In sum, the effects of our various control variables confirm earlier results such as Torgler's (2003), indicating a positive impact of education on tax revenues, as well as the findings of Frey and Schneider (2000) regarding the negative influence of the shadow economy on tax inputs.

Our results partially confirm the findings of Rodrik (1998) or Gupta (2007) concerning the balance of trade-tax revenues nexus, as well as the conclusions of Hirshman (2011) with respect to the influence of budgetary balances on taxation. Any differences in our findings could be the result of different samples and methodologies used relative to the earlier literature.

Summarising, our main findings show that in the case of EU countries net migration has a positive impact on the *change in collected tax revenues* and also on *the level of per capita collected tax revenues*. In other words, a rise of net migration determines an increase of tax revenues per capita collected by the public authorities in a destination country, with the potential to reduce deficits and public debt and improving budgetary balances.

6. Conclusions

Migration is a complex phenomenon, particularly in the context of recent developments in the EU, with important implications at the level of taxation for European member states. Investigating this phenomenon for 25 EU members, for the period 1996-2010 and based on a panel model approach, our main results reveal that net migration has a positive impact on the change in collected tax revenues and also, on the overall level of per capita collected tax. More precisely, a rise of net migration can trigger in destination countries an increase in per capita tax inputs collected by public authorities. This is a more consistent effect than the influence of capital mobility or trade openness on tax revenues. In other words, immigrants play an important and positive role in collected tax revenues in the EU.

These findings could be easily explained through the extension and flexibility of the tax base, even where tax rates are constant over time. More immigrants mean new potential taxpayers for the destination country, and where immigrants have superior expertise and skills, they also induce increases in overall productivity, further enlarging the tax base. In the context of our research, at least two further propositions can be formulated: the presence of immigrants - who remain in a majority legal at destination, in spite of an expected share of the informal sector - is not detrimental to tax collection. In contrast, for example, the pre-existence of a shadow economy is indeed negative for tax revenues; with the effects of this latter factor to be clearly distinguished from the presence of non-native workers in the economy. Moreover we can conclude that there is no indication of higher tax evasion in the presence of migration, and in spite of the limitations of constitutional rights in the case of non-national mobile workers that reduce their incentives to pay tax.

The policy implications suggest that in order to maximise tax inputs, European governments must have coherent immigration policies, accompanied by consistent internal controls of tax evasion. Finally, this research does not take into account public expenditure pressures induced by further immigration. Yet, we acknowledge that this aspect could have a major impact when marginal tax inputs generated by new immigrants are exceeded by marginal public expenditures. As such, we propose that the fiscal impact remains the subject of further explorations, which would take into account the insights offered by this

paper, in particular regarding migrants' tax payment motivations and the higher revenue implied by migration.

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Appendix

Table A.1 – Data Sources

Variable	Source of data
Change in tax revenues per capita	Calculated based on tax revenues in millions US dollars (International Monetary Fund online database, 2011) and total population in millions (European Commission, Eurostat online database, 2012).
Tax revenues per capita (in US dollars)	Calculated based on tax revenues in million US dollars (International Monetary Fund online database, 2011) and total populations in millions (European Commission, Eurostat online database, 2012)/
Rate of net migration plus statistical adjustment	European Commission, Eurostat online database (2012).
Balance of trade	International Monetary Fund online database (2011).
Net FDI	United Nations Development Programme online database (2011).
Budget balance	International Monetary Fund online database (2011).
Government effectiveness	World Bank online database (2011).
Share of medium and higher educated population	European Commission, Eurostat online database (2012).
Shadow economy	Schneider (2012)
GDP growth rate	International Monetary Fund online database (2011).

Table A.2 - Descriptive statistics of variables

Variable	Mean	Median	Maximum	Minimum	Std. Dev.	Sum Sq. Dev.	Observations
Change in tax revenues per capita (compared to the previous year)	0.110047	0.1	0.46	-0.12	0.115736	2.8665	215
Tax revenues per capita (in US dollars)	9,926.87	9,000	34,090	515	7,165.26	1.84E+10	215
Rate of net migration plus statistical adjustment	2.769302	2	21.3	-26.7	5.131193	5634.437	215
Balance of trade	-0.01285	-0.01452	0.172132	-0.21465	0.070545	1.06499	215
Net FDI	0.017604	0.009513	0.287465	-0.2279	0.057734	0.713317	215
Budget balance	-0.01415	-0.01404	0.068413	-0.123	0.02936	0.184468	215
Government effectiveness	1.216791	1.07	2.34	-0.41	0.659143	92.97649	215
Share of medium and higher educated population	0.665967	0.691	0.838	0.211	0.12908	3.565571	215
Shadow economy	0.221298	0.224	0.366	0.095	0.066593	0.949011	215
GDP growth rate	0.110372	0.1	0.44	-0.11	0.106555	2.42977	215

Table A.3 - The results of variance inflation factor (VIF) tests

Dependent variable	Change in tax revenues		Ln of tax revenues/capita (US $)	
Variables	VIF	1/VIF	VIF	1/VIF
Rate of net migration plus statistical adjustment	1.34	0.745984	1.33	0.753793
Balance of trade	2.24	0.446327	2.29	0.436766
Net FDI	1.38	0.724988	1.38	0.724232
Budget balance	1.45	0.688305	1.45	0.690634
Government effectiveness	4.9	0.203947	4.77	0.209848
Share of medium and higher educated population	1.32	0.758971	1.32	0.759955
Shadow economy	3.43	0.29157	3.29	0.303892
Mean VIF	2.29		2.26	