Can a Basic Income and a Flat Tax replace the Personal Income Tax?

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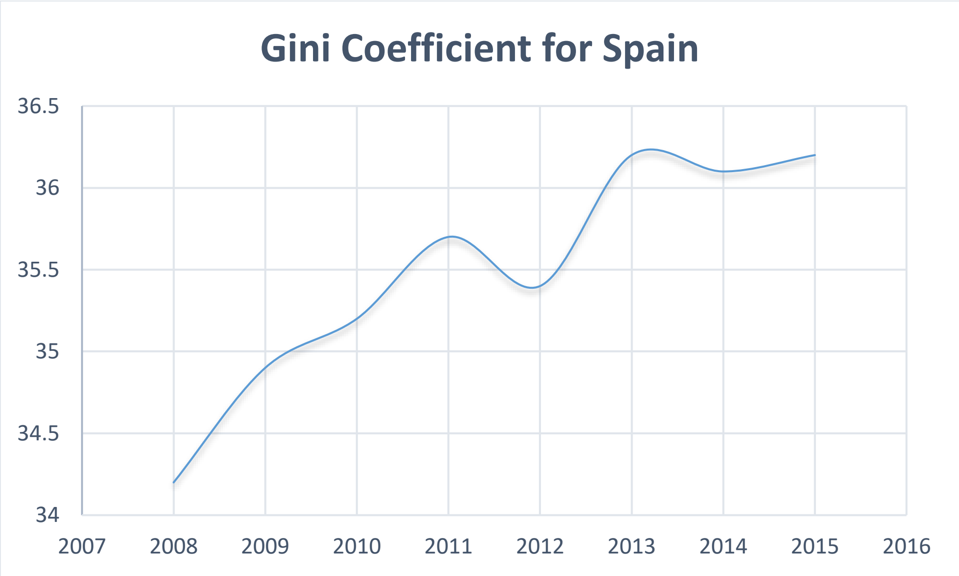
ABSTRACT

Growing inequality since the eighties in most developed countries together with the effects of the Great Recession, which affected more severely to lower incomes, pushed in the political agenda the need of improving the tax-benefit system. Systematically, one proposal to fight poverty and inequality is the possibility of implementing a basic income. Detractors of this proposal argue that the cost of this measure is too high and criticise the potential disincentives to work. However, some studies simulating this kind of policy ignore this second issue. This research aims to simulate some scenarios where this basic income is established combined with a proportional tax. The analysis is conducted using a behavioural microsimulation model of the Spanish tax-benefit system called Gladhispania. Specifically, there are 4 different reforms simulated, were the unique difference among them is the amount of the basic income disposed to the individuals. Thus, the proportional tax rate is higher as higher is the amount of the Basic Income, in order to accomplish a tax-revenue neutral reform. The results are compared among them and using as baseline the current situation (the 2016 personal income tax scenario). The results show that, the higher the Basic Income amount is, the more equality, progressiveness and redistribution, we see and also less poverty. On the other hand, in terms of efficiency, the reform may give some disincentives to work, as the hours worked are lower the bigger the amount of the Basic Income is. Also, gross income is reduced in the distribution after the reform is performed, which reveals another source of efficiency loss. In terms of budget feasibility, the reform is designed to be tax revenue neutral, as the analysis of the impact on the State's budget is not the aim of this research.

1. INTRODUCTION

In most developed economies, the growing inequality since the last two decades of the twentieth century among with the effects of the Great Recession, that pushed down medium-low and low incomes, have generated a need to improve the tax-benefit system. For Spain, this crisis hit especially hard: unemployment went from an 8% to a 25%, a long GDP loss, (recovering in the second quarter of 2017the level of the second quarter of 2017), migration of skilled labour force, etc. Inequality also raised over these years, as it is shown in figure 1. Inequality is measured by the Gini coefficient. It is computed as the double of the area between the Lorenz curve of an income distribution and the diagonal (perfect equality). The larger the coefficient the more inequality the distribution has.

Figure 1: Gini Coefficient for Spain (2008-2015)



Source: World Bank database

To reduce inequality over developed economies, a lot of proposals in terms of tax-benefit policies have been proposed: the vital minimum, the guaranteed minimum income, some in-work benefits, etc.

This research focuses on one proposal that has been gaining strength over the last years: A Universal Basic Income implemented together with a flat tax (BIFT onwards). The research focuses on the structure proposed by Atkinson (1996), who establishes a universal Basic Income financed by a Flat Tax, that would substitute the majority of social insurance transfers and any other welfare programmes.

There are many definitions of what a Basic Income is. Ullastres (2015) defines this measure as the implementation of a monetary assignment to every citizen, universal and independent of its personal and familiar circumstances. The measure of course, it's quite polemical and has a huge number of defenders and detractors.

The main goal of this research paper is to proof whether it is possible or not that this basic income combined with a flat tax, can replace the current Personal Income Tax (PIT). All the simulated scenarios are tax revenue neutral; they keep constant the tax revenue to assure feasibility. As in other studies, the present piece of work analyses the impact of the reform on inequality, poverty, progressivity and redistribution. But, the behavioural microsimulation model applied in this work also allows to measure the effect on labour supply, efficiency and welfare. Another contribution is to update the microsimulation model of the Spanish tax-benefit system that it will be necessary to simulate the reforms.

Some other authors have undertaken similar investigations, such as Fuenmayor and Granell (2017), who simulate a basic income through the mechanism of a Negative Income Tax (NIT). They simulate two potential scenarios: one with the NIT alone and another which includes a reform of the PIT to compensate the cost of the NIT.

They all proposed the same core research and with similar methodology: using non-behavioural microsimulation models which means that labour supply is not explicitly considered. This is an important point as most detractors of the basic income highlight the potential negative effects in labour participation. Garzon (2015) points this fact, by assuring that those individuals with no income would be better off, but those on the limit would be tempted to stop working.

For this research, I update Gladhispania, a microsimulation model that it is described in detail in Oliver and Spadaro (2004, 2007). It simulates the structure of the Spanish Personal Income Tax in an excel file and uses macros done in visual basic to simulate the tax-benefit system of each household. The input data used, is taken from the Spanish Institute of Statistics (INE), specifically the Survey of Income and Living Conditions (SILC)

After setting up all the microsimulation model making sure it reflects as faithful as possible the Personal Income Tax, some changes are made in the database. From all the database, only those households with two individuals (younger than 65 years old) with or without dependant children are kept. This is because the model requires households whose individuals are willing to work due to the personal circumstances, and that kind of household is the most willing to choose positive hours of work. After that, a wage rate is estimated for the observations left in the sample, using many variables included in the dataset. A set of alternatives for working hours is established, from where the individuals will be able to choose the time devoted to work.

In order to analyse the effect on the labour market, the utility function specified in Oliver and Spadaro (2017) is used. Using this function, the individuals choose among the set of alternatives established before, maximizing each household utility.

After the simulations are performed, an analysis concerning inequality, poverty, redistribution, progressiveness and the cost of the reform in terms of efficiency, is done, using different indicators that are going to be explained in section 4.

A Basic Income reform can be interesting for economies highly specialized in tourism. Specially in those tourism destinations where a high seasonality exists, as it is the case of the Balearic Islands. Seasonality provokes an income loss during the winter season to individuals that work in the tourism industry. Thus, a Basic Income can help to smooth individuals' revenues. Although it would be interesting to analyse the Basic Income reform at the Balearic Islands, the sub-sample is too small to get representative results. Instead, the study uses all Spanish regions, excluding the Basque Country and Navarra where the personal income tax is completely different. The effect of the reform for the whole territory of Spain would also be interesting for those territories highly specialized in the tourism sector, as the tourism industry contributes by a 11,7% to the Spanish GDP and by a 12,8% to the Spanish total employment in 2017[1].

The structure of the work is the following. Next section is devoted to the literature about the basic income. Previous papers using Spanish data are especially overviewed. In section 3, the methodology used in this project is explained: the behavioural microsimulation model, the specification of the labour supply on which the microsimulation is based, and the input data used for the research. In section 4, the scenarios and the results are presented.. Finally, section 5 concludes.

[1] http://www.expansion.com/economia/2018/12/18/5c18cf63ca4741c7648b4657.html

2. LITERATURE REVIEW

2.1 Some background

The basic income idea has been gaining strength over the last years, with the upswing of some left-wing parties in some important developed economies as the United Kingdom with the rise of the green party in 2015[2], or Spain with the appearance of Podemos to the Spanish political scene in 2014. Although, some authors defend that the basic income proposal goes beyond ideologies[3]. The truth is, the basic income/flat tax is a measure that has taken scholar's attention since the 90's. In Atkinson (1996), the author proposes a basic income/flat tax that would replace the existing social insurance and the rest of welfare programs. Roebroek (1993) also discusses the main features of a basic income, putting emphasis on the relation among social security mechanism and basic income and how the second could replace the first one in the future. Clark and Kavanaugh (1996) also discusses the form a basic income and which mechanisms apart from the flat tax can finance such measure. They also set the positions of every ideological stream and which are the pros and cons.

2.2 Basic Income Experiments

The basic income has been analysed and reviewed by many different authors from many ideologies. Also, some experiments have been undertaken in the past. To quote some examples, Goldsmith (2010) explains the details of a basic income program called "Alaska Permanent Fund" that was created in 1976. It started as a fund to share the revenues of a plant extraction of oil from the Prudhoe Bay field, that was used to buy secure but profitable assets assuring the long-term return of the fund. Later, in 1982, it started to be shared annually with all Alaskan adults, regardless of any personal circumstance. The "regardless of the personal circumstances" fits perfect on a basic income definition.

A similar experiment was carried out in Iran. According to Tabatabai (2012), "the Iran model" is based on a rise of fuel products prices, among others, that finance a universal giveaway to every Iranian resident regardless any circumstances of 40-45 per month.

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[2] See Wilderquist et al. (2013) p.118.

[3] See Chrisp (2017).

Another experiment was carried out in India by UNICEF and SEWA (Self-Employed Women's Association) in 2011. According to Standing (2013), in eight different villages in India, they granted every adult and children a certain number of rupees, paid individually and independently of their personal circumstances. They found out that the money improved the quality of life of the villages, improving housing, nutrition and health. The author also mentions that equity improve, as the lower-caste families had more bargaining power since they had their own money.

2.3 Literature for Spain

As it has been mentioned before, there are several studies that aim to show the results and the effects of a basic income. In the case of Spain, many papers can be found, defending and criticizing the measure. Noguera (2019) defines the basic income as a monthly payment from the state to the citizen regardless any condition, even the obtainment of other incomes. A definition quite similar as the one exposed in the introduction by Ullastres (2015) "implementation of a monetary assignment to every citizen, universal and independent of its personal and familiar circumstances". Noguera also categorizes different kinds on basic income: unconditional and universal[4], a "partial" basic income in the sense of quantity (like a small subsidy) or in the sense of the collectives affected (limiting it to the lowest incomes), a basic income conditioned to some activity, a basic income as a "second salary" (a complement to the actual wage) or a basic income in the form of a Negative Income Tax[5][6], which would be means tested (revenues would have to be checked) so it would not be unconditional.

A partial basic income is proposed for the Spanish Tax System by Prats (2003), evaluating 2 scenarios: one scenario using the partial basic income among with a progressive tax and a second scenario complementing the partial basic income with a flat tax.

This Negative Income Tax (NIT) form of Basic Income has been analysed by Fuenmayor and Granell (2017) who tested two different scenarios: one applying only the NIT and another one complementing it with a reform of the Personal Income Tax (PIT).

[4] Raventós (1999) quoted by Noguera (2019)

[5] The NIT aims to guarantee a basic income level by charging a tax those that surpass a certain income amount and subsiding (Negative Tax) to those who not surpass it.

[6] Sevilla (1999) quoted by Noguera (2019) for the case of the application of the NIT in Spain

Badenes et al. (2017) also proposed a basic income reform, that would be coexisting with the Personal Income Tax (PIT) so, instead, the basic income would replace the entire benefit system.
There are also some authors that reject or question the idea of a basic income. Garzon (2015) points the fact of the disincentives on the labour supply side and points to the fact that such a measure would change the way economic agents relate to each other.

Nevertheless, the need to go deeper in the analysis and measure the impact on labour supply and efficiency of the reform requires the use of a behavioural microsimulation model, in which individuals react to changes in the tax-benefit system, basically modifying his or her amount of desired hours of work. Oliver and Spadaro (2017) use this kind of analysis over different proposals of in-work benefit reforms. In fact, the methodology used in this research is very influenced by their work.

3. ***METHODOLOGY***

3.1 The labour supply model

I borrow the labour supply estimations from Oliver and Spadaro (2017). The starting point is a situation where the individuals maximize a utility function subject to a budget constraint. The utility of the individual depends on disposable income and leisure time. The budget constraint is a function of the tax-benefit system (T) which depends on the socio-economic circumstances of each individual.

$$Max_{y,L}\ U(y, L; Z) \qquad (1)$$

$$\text{Subject to} \quad y = \mu + wh - T(\mu, wh; Z)$$

The individuals maximize a utility function that depends on the disposable income, *y,* and leisure time, *L*. *Z* represents a set of individual's and households' characteristics. Disposable income is composed by the non-labour income, μ, and the labour income, represented as the product of the gross hourly salary, *w,* and the working hours, *h*. To the labour and the non-labour income, $T(\mu, wh; Z)$ is subtracted, which represents the tax-benefit system. It is a function of the non-labour and labour income and conditioned to the specific characteristics of the household and the individual.

Oliver and Spadaro (2017) use a discrete labour supply model (as in Van Soest, 1995). It is assumed that the individuals choose the number of hours from a finite set of alternatives. They also assume the unitary model. All the members of a household maximize a unique utility function. In the case of the couples, the utility function is reflected by equation 2.

$$Max_m U = U(y, l_m, l_f; Z; \varepsilon_j) \quad (2)$$

Where *m* and *f* are defining the male and female individual within the household. The budget constraint the maximization faces is defined as:

$$y = w_m h_m + w_f h_f + \mu - T(h_m, h_f, w_m, w_f, \mu, Z) \quad (3)$$

This budget constraint includes the males' labour income ($w_m h_m$) the spouse' labour income ($w_f h_f$), the total non-labour income of the household (μ) and a tax function that depends on h_m, h_f, w_m, w_f, μ, and the set of variables of every household (Z). The most important variables of this set are the number of children of the household and the age of the adults.

Then, the maximization faced by the households is:

$$Max_{h_m,h_f} \quad U(y, l_m, l_f, Z, \varepsilon_j) \quad (4)$$

subject to $y \leq w_m h_m + w_f h_f + \mu - T(h_m, h_f, w_m, w_f, \mu, Z)$

Being j the alternatives of working hours. T is defined as a non-linear term and very complex. It is computed using the microsimulation model that is going to be explained in sub-section 3.4.

The authors establish a quadratic form for the utility function specified above, to capture the diminishing marginal utility of income. Then, the utility function may be written as:

$$\begin{aligned} U^*(y, l_m, l_f, Z_m, Z_f, Z) &= \alpha_1 y^2 + \alpha_2 l_m^2 + \alpha_3 l_f^2 + \alpha_4 y l_m + \\ &+ \alpha_5 y l_f + \alpha_6 l_m l_f + \beta_1 y + \beta_2 l_m + \beta_3 l_f + \varepsilon_{ij} \end{aligned} \quad (5)$$

The utility function considers interactions among variables of the individuals within the couple.

Oliver and Spadaro (2017) consider observed heterogeneity in the estimated parameters, meaning that, even though there is only one utility function for the whole population, the estimated parameters are going to be different among the households since a part of the estimation will depend on the socio-demographic characteristics of the household.

$$\beta_1 = Z\ \beta'_1$$
$$\beta_2 = Z_m \beta'_2 \quad (6)$$
$$\beta_3 = Z_f \beta'_3$$

Also, the authors compute a term of fixed costs for women that are working. This can include costs related with kindergarten, transport expenditures, etc. This cost is estimated by maximum likelihood with the rest of parameters of the utility function.

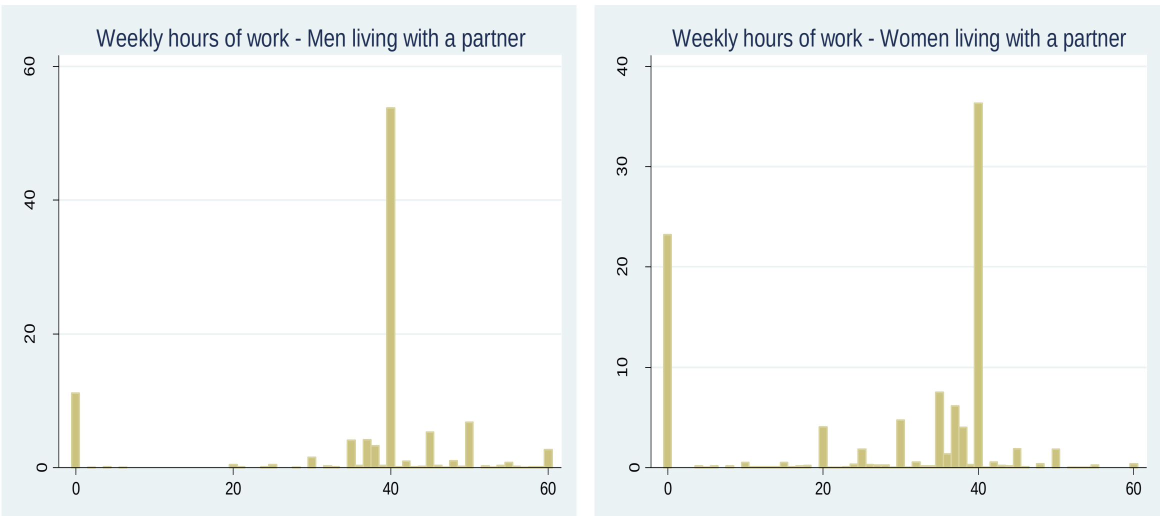
$$FC = Z_{fc}\beta_{fc} \quad (7)$$

Where Z, Z_m, Z_f and Z_{fc} are sets of characteristics of the individuals.

After having defined the model, it is needed to establish the discrete set of hours that the individuals choose. We use the histogram of observed working hours. The information is shown in figure 2. The histogram shows that the distribution is different among genders.

The set of hours chosen for men is 0, 40 and 50 hours and for women 0 ,25 and 40 hours. The alternatives chosen are based on the peaks of the distribution shown in the histogram. Men are more likely to work long hours, while women are in part-time job more frequently. In total, there are 9 options per household.

Figure 2: Weekly hours of work for men and women living in a couple



Source: Own elaboration using the observed working hours stated in the SILC

Note: This histogram corresponds to the couples' sub-sample.

Once the set of hours are defined, the disposable income of the household can be written as:

$$y\left[h_m, h_f\right] = w_m h_m + w_f h_f + \mu - T(h_m, h_f, w_m, w_f, \mu; Z_m, Z_f, Z) \quad (8)$$

Where $h_m \in \{0{,}40{,}50\}$ and $h_f \in \{0{,}25{,}40\}$; being w_m and w_f the gross hourly wage for the male and for the female.

After defining the total income of the household in function of the set hours to be chosen, every household is able to maximize its utility. The equation maximized is (9) using maximum likelihood.

$$\Pr\left[h_m = h_m^j, h_f = h_f^k, Z_m, Z_f, Z\right] = \Pr\left[U_{\{h_m^j, h_f^k\}} > U_{\{h_m^s, h_f^t\}} \forall s \neq j, t \neq k\right] = \\ = \frac{\exp\left[U\left(y\left[h_m^j, h_f^k\right], l_m^j, l_f^k; Z_m, Z_f, Z\right)\right]}{\sum_s \sum_t \exp\left[U\left(y\left[h_m^s, h_f^t\right], l_m^s, l_f^t; Z_m, Z_f, Z\right)\right]} \quad (9)$$

Table 1: Labour supply estimation parameters

Variable	Coefficient
$Income^2$	-0.283***
Male leisure $hours^2$	-45.464***
Female leisure $hours^2$	-83.472**
Income x male leisure hours	1.922***
Income x female leisure hours	0.929
Male leisure hours x female leisure hours	-4.049
Income	1.896**
x Age of the male	0.039
x Age of the female	0.211*
x 1(Children 0-3)	-0.278
x 1(Children 3-15)	-0.391
Male leisure hours	91.527***
x Age of the male	1.651***
x Age of the male squared	0.841***
x 1(Children 0-3)	-0.278
x 1(Children 3-15)	-0.625***
Female leisure hours	140.225**
x Age of the female	0.062
x Age of the female squared	0.968***
x 1(Children 0-3)	2.416
x 1(Children 3-15)	2.941***
Fixed costs	1.418***
x 1(big city)	-0.03
no. children	0.116***
Number of observations	3607
Pseudo-R^2	36.87
Log likelihood	-6347.925

Source: Oliver y Spadaro (2017)

In table 1, the coefficients of the estimation are displayed. Oliver and Spadaro (2017) use 2007 data. I borrow their utility function coefficients because labour market in 2007 was more flexible before the crisis. In 2016 the unemployment rate was around 20%, which makes unrealistic that individual can choose freely their labour supply.

In the following table, the elasticities of the coefficients are displayed:

Table 2: Elasticities at the intensive margin (hours) and at the extensive margin (participation)

	Change in	Increase in female wage rate	Increase in male wage rate
Females	Participation	**0.26**	0.024
	Working hours (uncond.)	**0.51**	0.023
	Working hours (cond.)	**0.038**	
Males	Participation	-0.034	**0.176**
	Working hours (uncond.)	-0.042	**0.212**
	Working hours (cond.)		**0.016**

Source: Oliver and Spadaro (2017)

The elasticities parameters show an inelastic labour supply for both male and female, since all the values are below 1. Changes in wage rates are not proportional to participation. Elasticity of women participation is slightly higher than men's, meaning a more sensitivity choice of participating in the job conditioned to the wage rate.

Oliver and Spadaro (2017) define unconditional elasticities (extensive margin) when the effect of participation and working hours are accounted together, which in the two cases is below 1. Again, the value is slightly higher for females than for men, which means that females working hours are more sensitive to variations on the wage rate. The conditional elasticity (intensive margin) captures the change of hours of work after a wage rate increase, conditional of being working previously. The elasticities are much smaller, implying that reactions are basically on the extensive margin.

However, elasticities change a lot across the income distribution. In the following figure, Oliver and Spadaro (2017) sorted the income distribution by deciles and calculated the elasticities of labour supply versus changes in the wage rates by income deciles. The results are the following:

Table 3: Elasticity of conditional and unconditional expectation of working hours

Pre-reform gross income deciles	10% increase in the female wage rate		10% increase in the male wage rate	
Unconditional	**Females**	**Males (cross elasticity)**	**Males**	**Females (cross elasticity)**
1	4.3846	0.5312	4.1383	1.2069
2	5.1727	-0.0727	0.1976	-0.279
3	3.7508	-0.0741	0.1088	0.0391
4	1.0728	-0.0716	0.0814	-0.0845
5	0.4366	-0.0561	0.0797	-0.0297
6	0.2153	-0.0724	0.0253	-0.0141
7	0.2153	-0.0487	0.0253	0.0026
8	0.1379	-0.0634	0.0337	-0.0106
9	0.0989	-0.0652	0.0194	0.0049
10	0.0743	-0.0817	0.0245	-0.0037
total	**0.506**	**-0.0425**	**0.2123**	**0.0234**
Conditional				
1	0.014	-0.1	0.017	-1.085
2	0.007	-0.09	0.01	-0.573
3	0.024	-0.068	0.006	-0.236
4	0.036	-0.065	0.011	-0.17
5	0.046	-0.05	0.019	-0.128
6	0.041	-0.056	0.018	-0.093
7	0.039	-0.06	0.015	-0.058
8	0.033	-0.068	0.019	-0.049
9	0.048	-0.066	0.022	-0.03
10	0.032	-0.071	0.016	-0.038
total	**0.038**	**-0.067**	**0.015**	**-0.115**

Source: Oliver and Spadaro (2017)

As we see, the most elastic part of the labour supply (elasticity higher than 1), comes from lower incomes until the 4th decile, for women. There is even less sensitivity versus wage rate changes for men's labour supply, as only the first decile is considered elastic (elasticity higher than 1). Not considering participation (conditional elasticity), labour supply is hugely inelastic in all deciles of the distribution.

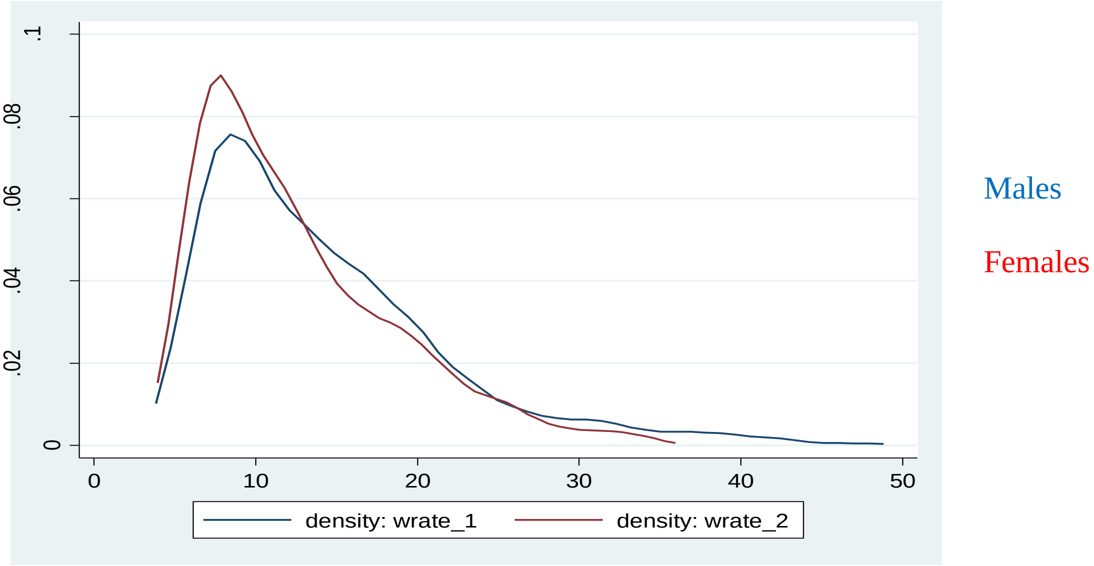
This elasticity analysis helps to understand why BIFT reform will reduce labour supply more intensively than the gross income.

3.2 Estimation of wages

The dataset used for this research provides information about the annual labour income and the weekly number of hours worked. With this information, and through simple calculations, it is easy to obtain an hourly wage for every individual, if the individual is working and states the needed information.

The distribution of wages is displayed in figure 3. Women are likely to receive lower wage rates than men. There are not observations close to 0, because those with a salary lower than the Minimum Salary are excluded from the sample.

Figure 3: Density function for wages for men and women



Source: Own elaboration using data from wages stated in the SILC

Note: This density function corresponds to the modified sample keeping only couples with dependant children as mentioned in the introduction

Since the sample has been reduced to take only couples with or without dependant children, as they are the kind of household who is likely to work or to look for a job, there are some households whose salary is not stated. Since a salary for every individual is needed, it is estimated using a Heckman selection model for those with unobserved salary (not stated or unemployed), using the characteristics of the individuals with stated salary. The parameters of the estimation are in Table 4.

Table 4: Heckman estimation of wages

Variable	w		selection	
	male	female	male	female
Education				
primary	0.023	0.011	0.440**	0.427
secondary	0.131	0.085	0.777***	0.768**
secondary +	0.300***	0.226	1.094***	1.002***
secondary + general	0.413***	0.281	1.478***	1.031***
secondary + professional (without superior access)	0.562*	0.424	6.534	6.542
secondary + professional (with superior access)	0.478***	0.146	2.399***	0.694*
other education (not superior)	0.118	0.294	1.094**	0.974
superior	0.639***	0.665***	1.660***	1.675***
experience	0.008***	0.020***	0.054***	0.078***
age	0.066***	0.031**	0.243***	0.126***
age sq	-0.068***	-0.042**	-0.339***	-0.205***
Med pop density	-0.068***	-0.082***	-0.182***	-0.052
Low pop density	-0.114***	-0.079***	-0.222***	-0.001
Constant	0.327	0.913**	-5.414***	-3.308***
Children dummies				
dchild1			0.124*	-0.044
dchild2			0.256***	-0.103
dchild3			-0.061	-0.264**
Non-labour income			-0.098***	-0.045***
Regional dummies	Yes	Yes	Yes	Yes
Mills' ratio	0.195**	0.298**		
chi2	674.704	335.114		
N	3209	2955		

Source: own estimations using data from the SILC

Note: For the Heckman calculations, region dummies were used as control variables, but they were removed from the table due to their lack of significance

First, men and women are split. Then, there is a probit model as a first-stage regression that estimates the probability that an individual chooses to work. The variables included in the estimation consist in different dummies to identify the degree of education, experience, age, age squared, region dummies and number of children within the household. Most of the region variables are not significant in this selection step, while educational degrees and experience are statistically significant and have a positive impact on the probability of choosing to work, specially for those individuals with higher education.

Age and age squared are also relevant. Age has a positive impact on the probability of working while age squared diminish that probability, revealing a quadratic effect of age on the probability of working. The child dummies are also relevant, but with different effects over men and women: for men, the fact of having one or two children, increase the probability of choosing to work, while for woman, the parameter is only significant for more than 3 children, which has negative effect on the choice of working. This fact supports the choice of Oliver and Spadaro (2017) to include fixed costs only for women in the calculation of the utility. Also, non-labour income is statistically significant, and with a negative effect over choosing to work.

The Mills ratio is significant in both estimations, which means that the selection process has influence over the wage estimation, which means that self-selection exists and making an OLS over workers is biased without including the Mills' ratio.

The experience effect seems more important in the selection process than in the wage estimation. Age and age square are still significant. Age affects positively to the wage while age squared decreases it. Also, population density is significant in the wage estimation, affecting positively to the wage obtained the higher the population density of the region is.

3.3 Data

The input data used in this research comes from the Spanish institute of statistics (INE). Specifically, the 2017 SILC is used. It provides information about Spanish households including information of the members and variables from the household itself. It provided information about income, educational levels, labour information, health, etc.

Once the microsimulation is set and calibrated, the research only focuses on a sub sample consisting in couples with or without dependent children[7], as they are potential workers, so the households that did not fit in this description were erased from the sample.

3.4 The microsimulation model

The tool used to analyse the Basic Income reform is a behavioural microsimulation model called Gladhispania that has been used before in other works[8]. Oliver (2013) highlights the benefits of using microsimulation models when evaluating public policies. He postulates that microsimulation models accomplish to catch the heterogeneity that characterizes societies and consider relevant dimensions that are important when analysing social policies (age, sex, economic status, labour situation, etc.) instead of using an approach focused on “relevant individual” because the relevancy of the policies and the accuracy of the analysis could be biased. Also, microsimulation models are very good at capturing the complexity that characterizes the tax-benefit system of the European countries and can replicate accurately the tax-revenue and the financial cost of the measure.

The model has two different parts: an arithmetical microsimulation model ran on Microsoft Excel using a Visual Basic macro and a behavioural part that will go through Stata using the arithmetical microsimulation model output.

The Spanish tax-benefit system will be simulated, adapting it to 2016 scenario, using as baseline for the Personal Income Tax the 2016 manual provided by the Spanish Tax Office (AEAT). Also, the social contributions[9] will be simulated, both the ones payed by the employee and the ones payed by the employer. The model calculates the tax rate for each individual within a household, taking into account the personal circumstances. After that, and subtracting the social contributions payed by the employee, a disposable income of the whole household is defined, doing the sum of all the disposable incomes of the individuals or doing a combined declaration, in which case all the household’s income is considered. The model chooses the option that makes the tax payment the lower, as it is the rational way to act for the household.

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[7] In terms of the SILC notation, the type of household following this description and used in the research are 8, 11, 12 and 13.

[8] See Oliver and Spadaro (2004, 2007, **2017**) and Labeaga, J. M., Oliver, X., & Spadaro, A. (2008)

[9] Extracted from 2016th Spanish General Budget (https://www.boe.es/buscar/act.php?id=BOE-A-2015-11644&p=20180704&tn=1#a115)

In the specification of the labour supply model that has been displayed in previous sections, specifically in equation (8), the T term is the one that is simulated here. It is an extremely complex term that depends on the personal characteristics of every individual and from the whole household itself (Z, Z_m and Z_f) as well as individual labour incomes and non-labour incomes. Using them, a tax rate is calculated, depending on the variables previously specified for the term T.

In order to transform the model where the individuals have different choices of hours within the set that has been mentioned before, the gross income of the individuals is transformed into the product among the weekly hours of work and the hourly salary. As it was explained in 3.2, for the households that stated their working hours and their gross income a wage rate was calculated from it. After that,
and using the variables of those from who we have information, a wage rate is estimated for those who haven't stated their salary or their gross income, due to the need to have a wage rate for every individual. Note that, at this point, the sample is already reduced, keeping only the observations of couples with or without dependent children.

The alternatives that individuals can choose are already established ($h_m \in \{0,40,50\}$ and $h_f \in \{0,25,40\}$;). The arithmetical microsimulation model simulates the tax rate and the disposable income for every household, that makes 9 options for every household. Then, the simulation output is executed with Stata and, using the labour supply model explained in 3.1, individuals choose the option that maximizes their utility.

4. ***RESULTS***

4.1. Basic Income reform simulation

With the choice of working hours of every individual in the sample, we are able to simulate the basic income reform and analyse the change of this choice among the discrete set of options mentioned before among with a set of indexes that will allow to analyse elements like inequality, poverty, efficiency, etc.

Using the Stata output from the last part of the microsimulation, where the individuals chose the alternative that maximizes their utility, the simulation of the Basic Income is performed. There are 4 proposed scenarios:

Table 5: Simulated scenarios

	Ref. 1	Ref. 2	Ref. 3	Ref. 4
Poverty line	8522	8522	8522	8522
BI (% of poverty line)	50	60	70	80
Flat Tax	32.80%	36.90%	41.40%	46.30%
BI per equivalent adult	4261	5113	5965	6818
Tax collection	0.12%	-0.07%	0.18%	0.12%

Source: Own elaboration using the output data from the simulation

The Basic Income amounts proposed, are a percentage of the poverty line, which is defined as the OECD proposes, as the 60% of the median of the income distribution. Thus, the amount of the BI consists in a % of this poverty line, going from a 50% to an 80% of it. The financing method of the reform consists in a flat tax rate that is applied to all the individuals in the population. In order to make this reform revenue neutral, the flat tax rate is higher as higher is the Basic Income amount proposed. As it can be seen, the tax revenue doesn't vary more than a 0,18% from the one obtained with the PIT, since this research does not focus in the feasibility of the reform in financial terms.

4.2 Inequality, redistribution and progressiveness

In order to measure inequality, redistribution and progressiveness; 3 different indexes are going to be used and they are displayed in the following table:

Table 6: Measures of inequality, redistribution and progressiveness

	Ref. 1	Ref. 2	Ref. 3	Ref. 4
Inequality Gini (0.267)	0.252	0.239	0.225	0.209
var (p.p)	***-1.5***	***-2.8***	***-4.2***	***-5.8***
Redistribution R-S (0.032)	0.063	0.079	0.096	0.116
var (p.p)	***3.1***	***4.7***	***6.4***	***8.4***
Progressiveness Kakwani (0.129)	0.222	0.272	0.322	0.373
var (p.p)	***9.3***	***14.3***	***19.3***	***24.4***

Source: Own calculations using the output data from the simulation

For measuring inequality, the Gini coefficient is the one that is going to be used and it is defined in figure 1. The results show that a Basic Income reform reduces inequality as, the higher the amount of the BI is, the more egalitarian the distribution is.

When it comes to measure redistribution, Reynolds-Smolensky Index is the one used. It captures the reduction of inequality due to the tax-benefit system and it is defined as the difference between the Gini Index of the gross income (before tax-benefit system) the Gini Index of the net income (after the tax-benefit system):

$$RS = G_{gross} - G_{net} \tag{10}$$

The results show that redistribution is improved, and the intensity of this improvement is higher the higher is the BI and the flat tax rate. Also, the marginal increase in redistribution is also higher, as higher is the amount of BI.

For the progressivity analysis, the Kakwani index is the one that has been analysed. Progressivity is defined as, in which proportion the higher tax rates are applied to the higher incomes, in other words, if the richer individuals are paying more taxes. The Kakwani index is defined as:

$$Kakwani = C_t - G_x \tag{11}$$

Where C_t is the Concentration Index of the tax system and G_x is the Gini index of the gross incomes. The results show that progressiveness is highly increased, higher the increase is as higher is the BI amount and the flat tax rate.

4.3 Poverty analysis

For the poverty analysis, 3 indicators are going to be used. The Head Count ratio, that measures the percentage of poor individuals, in other words, the percentage of individuals below the poverty line[10]; the Income Gap Ratio, that measures the intensity of poverty, calculating the distance between the average income of the poor households and the poverty line; and the Poverty Gap ratio (HI), that mixes the analysis of the two previous indexes, mixing intensity and quantity. The results of these indexes are displayed in the following table:

[10] Calculated before and set as the 60% of the median of the distribution

Table 7: Poverty indexes

	Ref. 1	Ref. 2	Ref. 3	Ref. 4
head count ratio (8.44)	7.80	6.21	4.99	4.37
var (p.p)	-0.64	-2.23	-3.45	-4.07
income gap ratio (49.79)	24.18	21.93	18.15	11.70
var (p.p)	-25.61	-27.86	-31.64	-38.09
poverty gap ratio (0.042)	0.0189	0.0136	0.009	0.0051
var (p.p)	-2.31	-2.84	-3.3	-3.69

Source: Own elaboration using the output data from the simulation

In terms of percentage of poor individuals, the reform accomplishes to decrease them, being this decrease higher as higher is the BI and the tax rate, reaching a percentage of 4,37% of the individuals below the poverty line in ref 4 (8,44% with the PIT).

It also accomplishes to decrease the intensity of the poverty of the distribution, as in PIT the value of the Income Gap Ratio was 49,79, meaning that the mean income of a poor individual is the 51,21% of the Poverty line. The reform accomplishes to diminish the ratio from a 25,61 (mean income of the poor individuals is almost 75% of the poverty line) for ref 1 to a 11,70 (mean income of the poor individuals is almost 89% of the poverty line) for ref 4.

If both indexes are accounted together, the results follow the same path as the previous analysis, as poverty gap ratio also falls with a BI and a Flat Tax, and the decrease of the index is higher as bigger is the reform.

4.4 Efficiency and Welfare

The effects of the Basic Income Flat Tax reform over efficiency are going to be analysed from the point of view of the labour supply, in terms of variation of hours worked by the individuals; and from the point of view of the gross income of the population. Welfare effects are also going to be commented in this section using two indicators: measuring welfare from the point of view of the mean utility and the from the mean income, using the Social Welfare Function proposed by Amartya Sen in 1973:

$$W = \mu(1 - G) \tag{12}$$

Where µ will represent mean income or mean utility. All the indicators are displayed in the following table:

Table 8: Efficiency and Welfare indicators

	Ref. 1	Ref. 2	Ref. 3	Ref. 4
Efficiency				
Gross income	-3.52%	-5.08%	-6.96%	-9.33%
Labor Supply				
Var h male	-9.41%	-12.63%	-16.42%	-20.95%
Var h female	-11.10%	-14.19%	-17.90%	-22.37%
Welfare, (W=µ(1-G))				
Mean utility (var %)	0.02%	0.03%	0.03%	0.03%
Mean income var (%)	-3.02%	-3.39%	-4.22%	-5.50%

Source: Own calculations output data from the simulation

In terms of efficiency, the results show a decrease of the total gross income of the population, from the PIT scenario. The lost of efficiency in this sense is bigger as bigger is the BI, reaching almost a 10% of gross income lost for ref 4. In terms of labour supply, the effects follow the same direction, revealing a decrease in the hours that the individuals choose to work that is higher as bigger is the reform. The decrease of hours worked reaches a 20% for men and a 22% with the biggest reform proposed.

In terms of a welfare analysis, considering mean expected utility, the results show a small positive variation that may not have a strong significance (less than 0,03 %), while using mean income, social welfare decreases with the BI reform, higher the decrease as bigger the reform is.

The elasticities analysis done before, can shed light to the fact of the difference in variation of working hours and the reduction of the gross income. Results show that the reduction of working hours is considerably higher than the reduction of the total gross income. This is because the lowest part of the distribution had the highest elasticity of working hours versus changes in wage rates. The variation of the lowest incomes working hours don't mean a great proportion of the total gross income of the distribution. The same intuition can be given to the welfare analysis, even though inequality has improved, the weight of those individuals in the total gross income is very small, so the magnitude of the variation of the gross income is higher than the decrease of inequality.

5. *CONCLUSION*

In this research, a microsimulation model has been used to analyse the effect of the implementation of a BIFT that substitutes the PIT over a representative sub-sample of Spanish couples with and without dependent children. The effect that have been measured concerned inequality, poverty, redistribution, progressiveness and efficiency.

The BIFT reform scenarios consist in establishing a general giveaway to every adult of the sample, of the amount of a percentage of the poverty line, calculated as the 60% of the median of the distribution. Together, a flat tax is applied to all the adults that substitutes the PIT. This flat tax varies so the reform is tax-revenue neutral. The 4 different scenarios consisted in different BI amounts among with different flat taxes, using the 50%, 60%, 70% and 80% of the poverty line as the amount for the giveaway.

The results of the reform go in the expected direction. The BIFT provoked an improvement in terms of inequality, redistribution and progressiveness, as the indexes displayed show it. In terms of poverty, both in percentage of individuals and in intensity, poverty is reduced. We can conclude then, that the measure has a positive impact in terms of distribution of income.

Nevertheless, the costs of the reform must be considered. As it is said before, the reform has forced to be revenue neutral, as the analysis of the financial feasibility is not the aim of this research. The costs that are analysed here are in terms of efficiency and welfare. Efficiency has been reduced due to the BIFT reform, both in terms of labour supply and total gross income. The number of working hours is reduced due to the BI and so, the total gross income in the sample is also reduced. In terms of welfare, the results also show a decrease, according to the Social Welfare Function used that considers the mean income/utility and the Gini coefficient.

The elasticities of the labour supply show a very inelastic labour supply both for males and females. Considering the income distribution, the lower deciles are the ones more sensitive to changes in the wage rate, specially in females. This fact explains the differences in terms of costs and benefits of the reform explained above: improvement in terms of income distribution but lost of welfare and efficiency. The reform mainly affects to the lower incomes, and so they are also the most likely to change their behaviour in terms of working hours. That is why the decrease of the gross income is less than proportional to the decrease of the working hours of the sample. Also, welfare decreases, as inequality (Gini index) decreases less than the decrease of the gross income, due to the labour supply elasticities just mentioned.

To finish, this research has some limitations. The sample used is a very specific one. It is true that is the most sensitive to changes in the tax-benefit system but is also a small part of the whole sample, so the effects of the BIFT reform cannot be extrapolated to the full population, since not all population segments are considered (e.g. retired individuals). The reform structure is simple, meaning that further tax rates can improve more income distribution while being more efficient. Also, it is assumed that individuals are free to choose whether to work or not, which as very optimistic assumption. Labour supply is very constrained by demand restrictions, specially in tourism areas where a strong seasonality exists.

BIBLIOGRAPHY

Atkinson A.B. (1996) Public economies in action: The basic income/flat tax proposal Anthony Barnes Atkinson. Lindal lecture series. Oxford and New York. Oxford University Press and Clarendon Press. Pp. 169

Badenes et al. (2017) Badenes Pla, N. Gambau-Suelves, B and Navas Román, M (2017) Redistributive effects and on the welfare of the substitution of monetary benefits for basic universal income in Spain. Instituto de Estudios Fiscales. Madrid. Spain. (pp. 2)

Chrisp (2017) Basic income Beyond left and right? Juncture. Spring2017, Vol. 23 Issue 4, p266-270. 5p.

Clark, C. M., & Kavanagh, C. (1996). Basic income, inequality, and unemployment: rethinking the linkage between work and welfare. *Journal of Economic Issues*, *30*(2), 399-406.

Fuenmayor Fernández, A., & Granell Pérez, R. (2017). Implantación de un Impuesto Negativo sobre la Renta. Microsimulación de su coste neto y efectos sobre la pobreza y la desigualdad. *Papeles de trabajo-Instituto de Estudios Fiscales, 2017, vol. 2017, num. 1, p. 1-44*.

Garzón, E. (2015). Renta Básica, una medida económica con importantes inconvenientes. *Disponible en Revista Viento Sur*, (140).

Goldsmith, O. S. (2010). The Alaska permanent fund dividend: A case study in implementation of a basic income guarantee. (pp. 1-8)

Labeaga, J. M., Oliver, X., & Spadaro, A. (2008). Discrete choice models of labour supply, behavioural microsimulation and the Spanish tax reforms. *The Journal of Economic Inequality*, *6*(3), 247-273.

Noguera (2019) José Antonio Noguera. (2019). La renta básica y el estado del bienestar en España. *Revista Internacional de Sociología*, (26), 65. https://doi.org/10.3989/ris.2000.i26.795

Oliver, X., & Spadaro, A. (2004). Are Spanish governments really averse to inequality? A normative analysis using the 1999 Spanish tax reform. *Investigaciones Económicas*, *28*(3).

Oliver, X., & Spadaro, A. (2007, February). Basic income or vital minimum? A note on the distributive effects of possible reforms of the Spanish income tax. In *Modelling Our Future: Population Ageing, Social Security and Taxation. International Symposia in Economic Theory and Econometrics. North Holland, Amsterdam*.

Oliver, X., & Spadaro, A. (2017). Active Welfare State Policies and Labour Supply in Spain. *Hacienda Pública Española*, (222), 9-41.

Oliver, X. (2013). La microsimulación como herramienta para la evaluación de reformas fiscales. *Revista electrónica sobre la enseñanza de la Economía Pública Págs*, *14*, 35.

Prats (2003) Prats, M. M. (2004). La aritmética de una Renta Básica Parcial para España: una evaluación con EspaSim. In *XI Encuentro de Economía Pública:[los retos de la descentralización fiscal ante la globalización]* (p. 57).

Raventós, D. (1999). *El derecho a la existencia: la propuesta del subsidio universal garantizado*. Barcelona: Ariel.

Roebroek, J. M. (1993). Images of the future: The basic income challenge. *Review of Policy Research*, *12*(1-2), 114-132.

Sevilla, J. (1999). Sobre pobres y ricos: una propuesta de renta fiscal universal para España. In *Políticas sociales y estado de bienestar en España: informe 1999* (pp. 275-302). Fundación Hogar del Empleado. Centro de Investigación para la Paz.

Van Soest, A. (1995). Structural models of family labor supply: a discrete choice approach. *Journal of human Resources*, 63-88.

Standing, G. (2013). India's experiment in basic income grants. *Global dialogue*, *3*(5), 24-26.

Tabatabai, H. (2012). From price subsidies to basic income: The Iran model and its lessons. In *Exporting the Alaska Model* (pp. 17-32). Palgrave Macmillan, New York.

Ullastres, J. A. G. (2015). Coste/beneficio de una renta básica. In *XXII Encuentro de Economía Pública: Reformas y nuevos retos de los Estados de Bienestar: eficiencia y equidad* (p. 3-6). Servicio de Publicaciones.

Widerquist, K., Noguera, J. A., Vanderborght, Y., & De Wispelaere, J. (2013). Basic income: an anthology of contemporary research. (pp.118)