Individual circumstances and income distribution in a changing labour market: Italy, 2005-2019

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Abstract

Occupational opportunities and labour market outcomes in Italy are unequally distributed by gender, migration background and geographical areas. The progressive liberalisation and flexibilisation of job contracts had the unintended effect of strengthening the role of social origin on labour market outcomes. In this work we ask: What is the role of individual circumstances inherited at birth in shaping the distribution of incomes across the workforce and how has it changed over time? This study aims to describe the role of individuals' socioeconomic background, gender, migration origin and area of birth along the distribution of income in Italy in the last two decades, embedding it into its broader labour market institutional framework. We analyse these issues taking into account for the birth cohorts of the workers observed within a labour market characterised by important transformations brought in across the last thirty years. We leverage data from the Italian collection of the Statistics in Income and Living Conditions (SILC) that contain retrospective information on individual social background. Going beyond mean comparisons, we apply a novel machine-learning technique to estimate the potentially heterogeneous relation between individual ascriptive characteristics and the distribution of the labour income distribution. The methodology adopted, transformation trees (Hothorn and Zeileis, 2021), allows us to derive the implicit "opportunity social groups" through the identification of the socioeconomic characteristics which determine different wage distributions. In this way, we will scrutinise whether inequality of opportunity changed in the last two decades, whether it changed more in the lower, middle or upper part of the distribution, and which circumstances are more responsible for these shifts. By adopting this perspective, this work contributes to various important debates related to inequality of opportunity, labour market reforms and in-work poverty.

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1 Introduction

Labour income inequality in Italy has grown significantly in recent decades following a very heterogeneous pattern across the national territory and demographic groups. In a decade-long wages stagnation context, research on labour income inequality in Italy has identified numerous at-risk social groups in today's society facing markedly adverse labour market conditions. Alongside wage stagnation, the loss of purchasing power and impoverishment of the working class with a consequent increase in income inequalities, there is also a series of structural reforms made to the labour market in Italy since the 1990s which affected the trend of labour income inequalities. On the labour market reforms in Italy, Hoffmann et al. (2021) show that the introduction of fixed-term contracts has increased the income volatility, while the spread of part-time played a relevant role in the rise of income inequalities. The Italian territory presents wide geographical differences in occupational quality and opportunity between the south and the centre-north regions (Camussi et al., 2021). Labour incomes inequalities are also particularly marked in Italy when comparing young cohorts with older generations (Rosolia and Torrini, 2016). On the wide topic of gender inequalities, empirical evidence on Italy suggests that gender differences in the labour market do persist on the side of labour earnings (Piazzalunga and Di Tommaso, 2019; Triventi, 2013). While the impact of the labour market structural reforms on incomes has been analysed by gender, qualification and cohort, the link between these institutional changes and the intergenerational transmission of inequalities is less immediate. Labour market outcomes are also influenced by the formation of occupational opportunities through the social and economic background of individuals. Sociological literature shows that beyond the effect of educational attainment, social class of origin still affects substantially individual occupational outcomes (Bernardi and Ballarino, 2016; Breen, 2004). In economics, the Inequalities of Opportunity (IOP) literature provides a sound theoretical framework to measure the relevance of social origin and parental background in the intergenerational reproduction of inequalities (Roemer, 1998; Roemer and Trannoy, 2015).

Given the strong institutional changes and their diversified impact across cohorts and territory, the Italian case seems to be of high interest to study the implications of reforms and policies on inequalities of opportunity from an institutional and geographical perspective. In the quantitative sociological literature, Barbieri and Gioachin (2022) assess this relation for the labour-market entrants, and they stress that the progressive flexibilization of job contracts had the unintended effect of strengthening the role of social origin on labour market outcomes. With our paper, we refer to the IOP theory to measure what is the role of individual circumstances inherited at birth in shaping the distribution of labour incomes across the workforce, and how has it changed over time considering the various structural reforms implemented in Italy in the last 30 years. In particular, this study aims to describe the role of individuals' socioeconomic background, gender, migration origin and area of birth along the distribution of income in Italy in the last two decades, embedding it into its broader labour

market institutional framework. We analyse these issues taking into account for the birth cohorts of the workers observed within a labour market characterized by important transformations brought by the Social pact, "pacchetto Treu" and Biagi reform in the nineties and early XXI century, the sovereign debt crisis, the 2012 Fornero ministry reforms and the 2014 Jobs Act reform. Among the studies on IOP in Italy, except for a few cases (e.g., Andreoli and Fusco, 2017; Mogila et al., 2022), labour market outcomes defined as annual labour earnings and contractual conditions have rarely been studied in the context of the intergenerational transmission of inequalities. Yet these two studies provide the estimation for a subsample of the entire labour force, namely the employees, without considering the self-employed. More specifically, Mogila et al. (2022) proposed a traditional parametric estimation of the ex-ante Inequalities of Opportunity à là Ferreira and Gignoux (2011) on the labour earnings providing a cross-country perspective on selected European countries and took into consideration the role of the degree of urbanisation as a circumstance. Andreoli and Fusco (2017) instead provide estimates of IOP within cohorts for 2011 and propose a a parents versus off-springs comparison on the side of educational policies in order to assess the role of the policies within the IOP results for selected European countries. The most common outcome variable considered in the IOP literature is the equivalent household income which aggregates various income sources besides labour (Andreoli et al., 2021; Brunori and Neidhöfer, 2020; Brunori et al., 2018, 2022a,b). Even if reflecting the overall income inequalities considering the household of belonging, studying inequalities of opportunity on household incomes lacks of several interesting focuses. First of all, household equivalent incomes do not allow the inclusion of gender within the discourse of inequalities of opportunity. Second, a general income concept such as disposable households income makes more difficult to analyse the relationship between the inequalities observed and the reforms or policies on the labour market. We investigate the formation of inequalities of opportunity on labour incomes in the Italian labour force taking into account for the institutional changes that have taken place on the side of labour market and the geographical disparities in the occupational and wage opportunities across the Italian territory. Our approach is to provide a cross-time and regions comparative study and we use observed cohorts in the set of circumstances. Including cohorts as circumstances we finally examine the relationship between the labour market policies and inequality of opportunity among workers. The IOP measure is an ex-post IOP implemented with the novel machine learning technique of the transformation trees proposed by Brunori et al. (2022b). With this technique we use a tree-based model to perform population partition according to the circumstances, then we estimate the type-specific income distribution relying on the Bernstein polynomial. In addition, we apply the shapely decomposition to estimate the relative importance of each circumstance variable within a specific year and geographical area. The reminder of the pare is as follows, a summary of the labour market reforms in Italy taking place in the last thirty years is presented in section 2. Section 3 illustrates the theoretical framework of the IOP model. Section 4 presents the estimation methodology. Section 5 describes the data

and some stylised facts on the Italian labour force conditions across the years of the reforms, section 6 presents the results with some discussion, and finally section 7 provides conclusion.

2 The labour market reforms in Italy in the last 30 years

The labour market structural reforms in Italy were initially oriented towards transformations following the Scandinavian "flexicurity" model, which was believed able to boost the Italian economy which was suffering for low productivity rates, and to fight against the wide and pervasive informal jobs in Italian labour markets. However, this set of reforms, by introducing several atypical jobs characterised by less rigid access and exit rules, had the unintended effect of creating a dual labour market. Within the dual labour market, those with fixed-term contracts, or the "insiders", have a high degree of guaranteed social protection, stable careers and work-related benefits while workers hired with open-ended contracts. The "outsiders" are instead experiencing more fragmented job careers, precarious contract conditions and low social protection related with the work-place. The first change in this direction is identified with the Social pact in 1993, which reformed the collective bargaining system and definitely eliminated the automatic wage indexation to inflation, a process already started in the second half of eighties following the hyper-inflation crisis disrupted from imported oil prices rise. Following, the Pacchetto Treu reform, 1997, introduced a strong liberalisation on the entry wages for first-job seekers and reduced the constraints for firms to hire part-time workers or apply fixed-term contracts. This reform actually gave legal foundation to the fixed-term contracts and introduced a special form of temporary semi-subordinate working contracts (the Co.Co.Pro and Co.Co.Co). The Biagi reform in 2003 created new forms of atypical contracts such as occasional employment (job vouchers) for domestic work, on-call jobs (*lavoro intermittente*) and job sharing. The new atypical contracts are less expensive for the employer in terms of lower required social security contributions due to both the employer and employee. The Fornero reform, 2012, intervened in a context of deep recession, fiscal austerity, high unemployment rate, rising poverty rate. The reform acted in two directions, on the one side increasing the applicability of fixed-term contracts for reabsorbing, even if temporarily, a part of the unemployed people in the labour markets. On the other side, to avoid the abuse of using fixed-term contracts thus, limiting the amount of fixed-term contracts in a given firm and the number of renewals for a single worker in the same firm. The last reform considered within this study is the Jobs Act reform, the Renzi reform, which took place in 2014 introducing a series of changes. First, it changed an article of the famous law 300 of 1970 regulating workers' freedoms and their rights in the face of trade union activity, workplace control and dismissals. Second it introduced a new, intermediate employment contract (*contratto a tutele crescenti*), with the goal of easing the

transition from fixed-term to open-ended contracts. This new form of contract was characterised by a smaller amount of social security contributions due in order to reduce the firm's labour costs. Third, it liberalised the job vouchers extending their applicability to almost all type of jobs and rising the income cap collectable with the vouchers.

3 Inequality of Opportunity: theoretical framework and measures

The literature on Equality of Opportunity has its roots in social welfare theory with the seminal contribution of Roemer (1998). Its theoretical model has been extensively used in empirical studies on unequal opportunities with respect to many individual outcomes such as income, educational attainment and health. Roemer's model divide in mainly two classes the factors influencing individual outcomes, factors on which the individual do not have control, the circumstances, and factors on which individuals have control, the effort. Let each individual i in a society have three attributes $\{y_i, C_i, e_i\}$, respectively, the individual outcome (e.g. labour earnings), the circumstances beyond individual's control (e.g. demographics, family background, origin country), and the effort (e.g. hours worked). While the circumstances are assumed to be observable by the policy maker, the effort exerted by the individual is not necessarily observable. This is not a limitation for its identification because the outcome is assumed to be a monotonically increasing function of the effort, $y_i = f(e_i)$. Furthermore, the effort is not independent from the circumstances and, as a consequence, its type-specific distribution should be accounted as a characteristic of the type. The absolute value of effort, when observable, is not an accountable information due to its type-specificity. The outcome can be as well directly influenced by the circumstances, therefore the whole set of relations can be summarised as follows:

$$y_i = f(c_i, e_i(c_i)) \tag{1}$$

It is possible to partition the population into K types according to the set of circumstances. The types are, thus, based on personal non-arbitrary characteristics. Given that the elements included in the circumstances are finite and each one is discrete, the partition of the whole population is homogeneous, thus each group is non overlapping. With the type partitioning we can observe population grouped in different opportunity sets, within each group people are facing the same non-arbitrary circumstances of life. A weak IOP postulate (ex-ante IOP) requires that all the differences in the earnings observed within the types are the same, regardless of the differences occurring within the types.

$$\mu^k = \mu^l, \ \ \forall l, k | T_k \ \in \Pi, \ T_l \in \Pi \tag{2}$$

Therefore, the Ex-ante IOP is measured applying an inequality measure on a counterfactual income distribution where all the incomes referred to the same

type-group are the same and eqault to the type-specific mean income μ^k. According to a stronger IOP definition, ex-post IOP, in a world in which opportunities are equally distributed, the income is uniformly distributed across all types for a given amount of effort exerted.

$$y_i^k(\pi) = y_j^l(\pi), \;\; \forall \pi \in [0,1]\,; \; i \neq j, \; \forall T_k, T_l \in \Pi. \tag{3}$$

Where π is the *rank* position of the person in the income distribution within a type, i.e. the relative position of the individual in terms of income within a specific type. In order to compute the ex-post IOP measure, we can thus realise a further population partition, i.e. the *tranches*, by dividing each type-specific income distribution into a discrete number of quantiles. The ex-post IOP measure is obtainable by transforming the income distribution in a counterfactual income distribution $\tilde{y}$. Following Checchi and Peragine (2010), the counterfactual distribution should contain only between-conditional distributions inequality, i.e. by replacing the outcome of individual i belonging to type k and to the quantile p of the type k's specific outcome distribution by:

$$\tilde{y}_i^{p,k} = \mu^{p,k} \frac{\mu}{\mu^p} \tag{4}$$

In this paper we provide estimates for the latter IOP definition, therefore we will analysis the ex-post inequality of opportunity.

4 Methodology

The measurement of ex-post IOP requires that we partition the population into social groups defined by the circumstances, then that we can estimate the type-specific income distributions necessary for constructing the final counterfactual distributions as in equation 4. We apply a data-driven methodology for deriving the population clustering borrowing from tree-based models as already used in IOP studies by (Brunori and Neidhöfer, 2020; Brunori et al., 2018, 2022a,b). More specifically we adopt the technique used by Brunori et al. (2022b), which refer to the transformation trees (TT) a supervised machine learning algorithm recently introduced by Hothorn and Zeileis (2021). Last, a shapely decomposition is applied to measure the relative contribution of each circumstance variable within the IOP measurement. With the TT approach we start from the estimation of an unconditional distribution, afterwards relies on the Bernstein polynomial function to fit conditional distributions for the various categories of circumstances and check for which partition there are sufficiently different conditional distributions. In other words, we derive the types in terms of the capacity of circumstances combination sets to describe the heterogeneity in the earnings across society. A split is allowed if the shape of the two resulting conditional distributions is sufficiently different. The algorithm works as follows:

1. Set a confidence level is set (α);
2. Set a polynomial order;

3. Estimate the unconditional distribution with a polynomial approximation;

4. Test the null hypothesis of polynomial instability parameters for all the possible partitions based on the circumstance variables;

5. If the *p-value* of the test is $> \alpha$, stop the algorithm;

6. If *p-value* $< \alpha$ then proceed with the split the sample according to the variable producing the smallest *p-values*;

7. Repeat steps $4:6$ for the resulting sample partitions

The alpha value is tuned on a 5 fold cross validation minimising the MSE of the model. The polynomial used in point 2, according to Wickelmaier and Zeileis (2018) is the Bernestein polynomial.

5 Data

We use the EU-SILC micro-data on Italy for the empirical study. EU-SILC is one of the official micro-data source used for the study of socioeconomic conditions among European countries. The data consists of representative sample of the Italian population. We perform the analysis on 2005, 2011 and 2019. These are the years for which the survey contain a special module on the intergenerational transmission of inequalities and submit questions on socioeconomic background of individuals at childhood which can be used in the IOP measurement. The estimation samples are referred to the workforce aged between 25-59 years old in each year and geographical macro-area (North-west, North-east, Centre, South and Islands). We therefore obtain one transformation tree, ex-post IOP estimates and shapely decomposition for each year and macro-area. The outcome variable is an age-adjusted individual income from labour (considering employees or self-employees). We perform an age-adjustment in order to correct the income distribution for the inequalities which naturally emerge across different experience stages of the entire career. The final age-adjusted income, for each year, is obtained by estimating a the log-polynomial equation of order 2 on the respondent's age and by subtracting the fitted income on the age polynomial. The circumstances, also defined as partitioning variable in the transformation trees methodology, are gender, origin country, parental activity/education/occupation at respondents age of 14, family type at childhood and cohort. The family type is a variable created harmonising the information available on family types across the three considered years (which is slightly changing in the type of categories between 2005 and the remaining years). The cohorts are defined in the following way:

- old = people born before 1950 and not yet retired (observed only in 2005)
- baby boomers = people born between 1950 and 1965
- generation X = people born between 1965 and 1980

- generation Y = people born between 1980 and 1995

Regarding the parental background information, we replace the missing cases on the parental occupation or education when available information on parents is observed on their activity. In this way, we sensibly reduce the subsample to be excluded from the analysis due to missing cases in one of the partitioning variables.

6 Results

Contextually to the IOP estimation, we present some general descriptive analysis on the earnings inequality across time in Italy to provide insights on the labour market transformations and relate the institutional change with income inequalities across time, different cohorts and geography.

6.1 The Italian labour market conditions and earnings' distribution across the years of the reform

Labour earnings in Italy are going through a decade-long stagnation, though the dynamics of wages is not the same across the territory and the earnings distribution. Table 1 presents the trend in the incidence of relative poverty for labour earnings within the following geographical macro-areas, North-West, North-East, Centre and South and Islands. The data represent the weighted percentage of workers whose labour income, both from employment and self-employment, falls below the relative poverty threshold (i.e. the official EU relative poverty threshold is the 60% of the weighted median equivalent disposable incomes).

In order to have a quick view on inequalities in labour incomes evolve across time and cohorts we compare with figure 1 the ratio in the average income hold by the top 10 percentile with the bottom 50th percentile of within-cohort incomes and we notice that inequalities for the two younger generations are growing fast while being still far from the average levels of the ratio when considering the baby-boomers or the older generation.

Table 1: Incidence of relative poverty among wages from employment and self-employment

	Centre	South.&.Islands	North-East	North-West
2005	27.58	31.59	26.91	27.95
2006	27.45	31.31	26.27	27.57
2007	27.33	31.04	25.64	27.20
2008	26.88	30.15	25.20	26.46
2009	27.37	30.41	25.69	25.95
2010	27.74	30.07	25.69	27.20
2011	28.54	31.10	26.13	27.32
2012	29.13	30.96	26.68	28.14
2013	29.13	33.15	25.83	28.08
2014	28.78	31.48	26.32	28.30
2015	28.86	31.40	26.20	27.89
2016	29.41	31.91	26.37	28.44
2017	29.85	30.46	26.52	29.44
2018	30.68	31.54	27.15	29.71
2019	29.95	31.24	26.71	29.87

Figure 1: Labour income Top 10/Bottom 50 ratio

In building a bridge from the labour market reforms to the earnings' inequalities, we can see how the incidence of fixed-term contracts liberalised with the

reforms in is related with income levels across time and geographical areas. We can see how the incidence of the use of these contracts is strongly concentrated at low income levels. Being it higher generally in the south, after the financial crisis it seems to have increased notably also in the north-east, being it a region with a high presence of agricultural base. Being a productive area characterised by a high presence of agri-food production and a considerable tourism sector, thus leading to a considerable presence of seasonal and intermittent workers, the typical targets the labour market flexibilisation reforms.

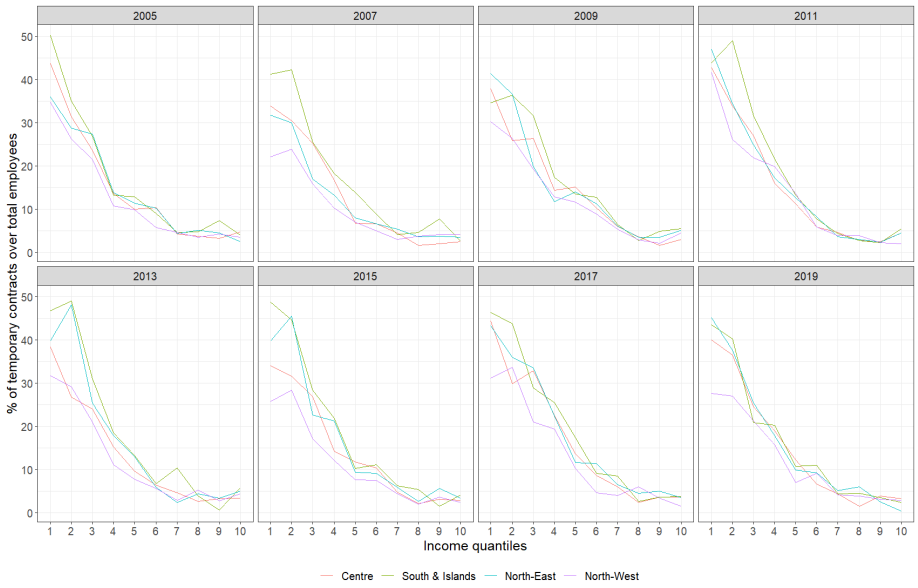

Figure 2: Caption

6.2 Ex-post IOP estimation results

Figure 3 shows a comparison between the total inequalities observed within a macro area and year and the inequalities of opportunity computed fro the same sample. From the point of view of labour income inequalities in general, the Gini shows a sharp increase between 2005 and 2011, only partly reabsorbed in 2019 except of the case of the North-East. On the side of ex-post IOP, we observe an overall reduction of IOP across time while the dispersion across geographical areas increased in the last period.

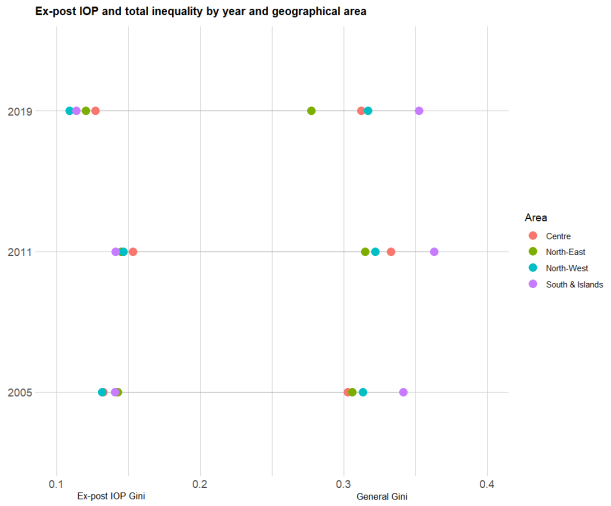

Figure 3: Caption

Figure 4 shows the types within each year and geographic area sorted by decreasing incidence of in-work poor people. In most of the areas and years the people who's labour income fall below the relative poverty line at national level are concentrated mostly in some types. One exception is in the south or islands where the in-work poverty incidence rises and becomes higher than 20% in many types. Meaning that in these areas the privileged people are concentrated in a few or even a single type.

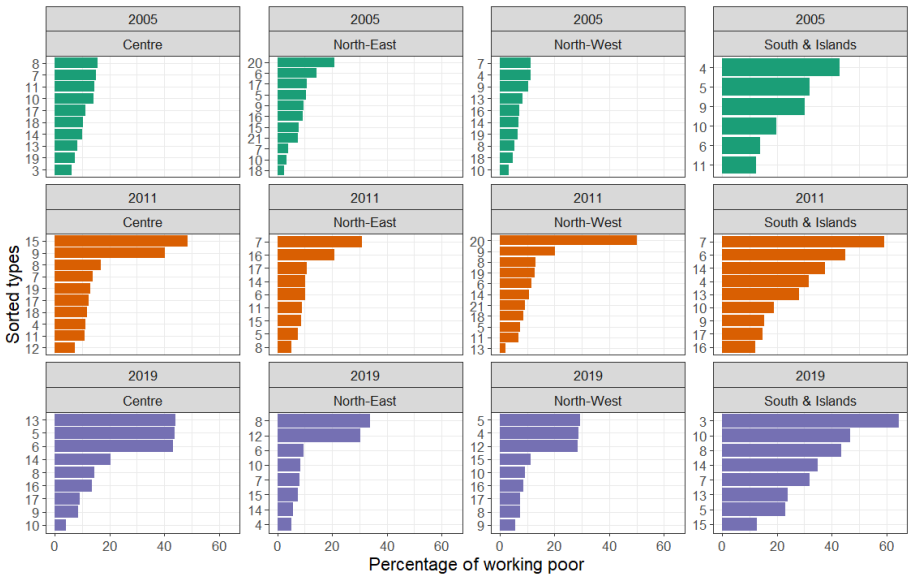

Figure 4: In-work poverty incidence

Figures 5, 6,7 and 8 show the TT for the 2019. The depth of the trees is around four splits in almost all the cases, and the terminal nodes are either 8 or 9. This means that they do not differ much in the "complexity" of the composition of circumstances which matter for the heterogeneity among the earnings distributions. Whilst the first split is always occurring on the gender, some differences emerge in the relevant variables among the successive splits.

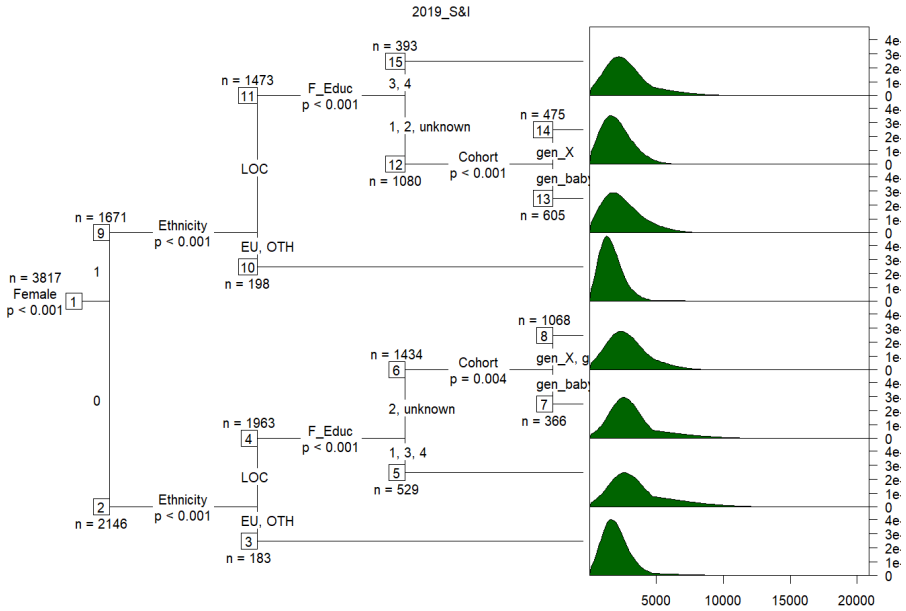

Figure 5: Transformation Tree for the South and Islands - 2019

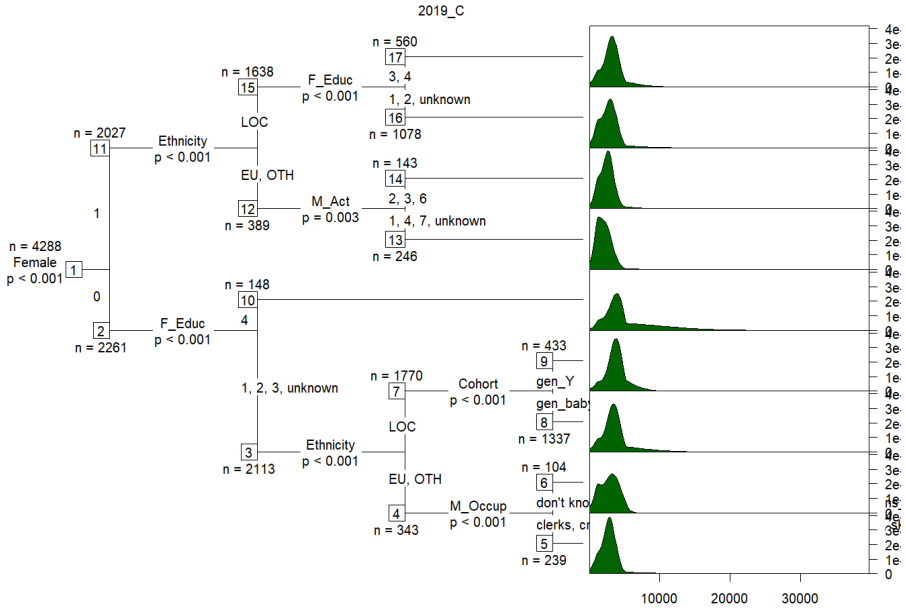

Figure 6: Transformation Tree for the Centre - 2019

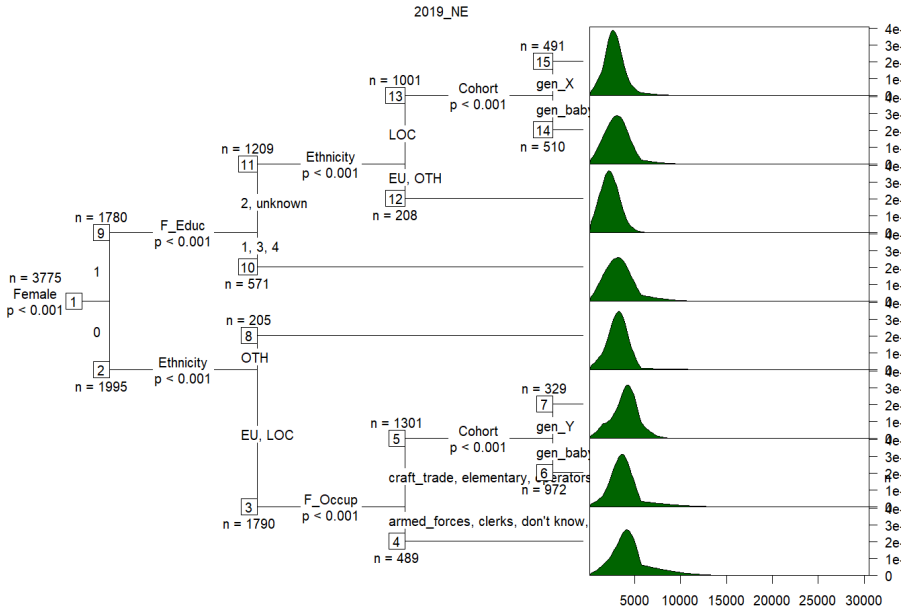

Figure 7: Transformation Tree for the North east - 2019

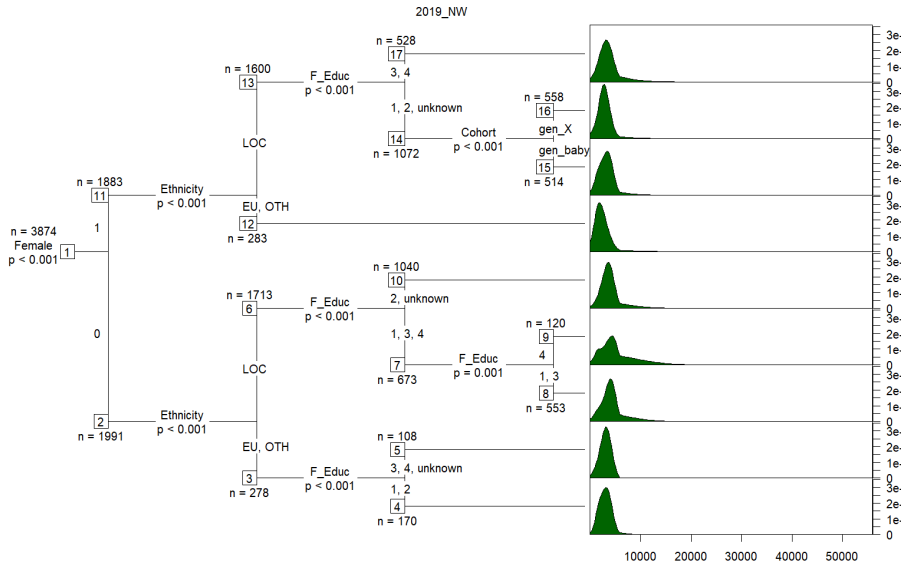

Figure 8: Transformation Tree for the North west - 2019

7 Conclusions

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