# USING CLUSTER ANALYSIS TO STUDY PARENTAL LEAVE POLICIES IN DIFFERENT COUNTRIES

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**Abstract**

Our study seeks to differentiate countries by the duration and flexibility of parental leave and to identify a potential correlation between these indicators and birth rates. We analysed durations of different types of leave related to parenting and explored elements in parental leave policies which increase flexibility of their usage. We identified 4 clusters of countries where two indicators—the duration of post-natal leave and the number of flexible instruments in the leave policy—yielded different combinations. Two clusters mirror each other—the maximum/minimum duration of post-natal leave combined with minimum/maximum flexibility of leave policies correspondingly. In Cluster 3, values for the leave duration and the number of flexibility elements were low; in Cluster 4, they were mean. Total fertility rates in these clusters did not show any statistically significant differences. We found significant differences for a number of additional parameters characterising parental leave systems, which is due to specific parental and paternal leave instruments more or less common in particular clusters.

Parental leave policies are part of a broader social and economic agenda, which enables meeting goals of state policy through support measures for families. Our results revealed clusters of countries where such policies are similar in basic parameters.

**Key words:** parental leave, parental leave policies, cluster analysis

**JEL Code:** J11, J18

## Introduction

A parental leave policy aims to perform a number of functions in the society. Most importantly, parental leave is intended to engage parents in taking care of children, which has a positive effect on children's psychological health (Amato, 1994). Parental leave benefits may pursue the targets of the state economic policy; for example, researchers claim that state support measures for families on parental leave improve their well-being, even though they have to bear

additional costs on children (Haeck et al., 2019). However, low compensatory benefits during parental leave force many parents to return to work (Boll et al., 2014).

A developed parental leave system ensures gender equality, gives women opportunities for professional development, and minimises the gap in the scope of household responsibilities between men and women (Duvander & Andersson, 2006). It is also believed that longer parental leave result in the higher engagement of fathers in the child raising process (Hook, 2006).

An important aspect of parental leave is its flexibility in use. A number of studies prove the relationship between the flexibility of the system and the level of parents' satisfaction with and commitment to their job (Butts et al., 2013) as well as the level of men's contribution to the childcare (Tervola et al., 2017).

Besides, a parental leave policy facilitates an educational policy; for example, Cools and coauthors demonstrate that parental leave taken by parents with the higher level of education result in the higher level of children's performance at the primary school (Cools et al., 2015). Moss concludes that taking parental leave reduces the burden on state childcare facilities (Moss, 2012).

A more evident target of a parental leave system, though, is demographic—to increase birth rates. It was found that men's engagement in raising children has a positive effect on the birth rate and facilitates a marriage decision when cohabitating (Kotila, 2014). What may also contribute to the birth rate is easing women's workloads and redistributing household responsibilities by, inter alia, including fathers into parental leave systems (Goldscheider et al., 2015). A number of researchers prove the relationship between gender equality and the birth rate (e.g., Balbo, 2013; Neyer, 2013).

Our study aims to differentiate countries by the duration of parental leave and by their flexibility. It also seeks to reveal a hypothetical relationship between these indicators and birth rates.

# 1 Data and Methods

We used the following sources of information:

1) International Review of Leave Policies and Research 2020, which presents data on parental leave policies in 47 countries (Koslowski et al, 2020);

2) Total Fertility Rates (TFRs) in different countries from 2000 to 2020 (The World Bank, 2020).

In our research, we analysed the duration of different types of leave related to parenting and searched for elements, which increased their flexibility (or variability) in use. We considered the following indicators:

1) total duration of post-natal leave;
2) total duration of parental leave;
3) duration of paternal leave;
4) number of flexibility elements in maternal leave;
5) number of flexibility elements in parental leave;
6) number of flexibility elements in paternal leave;
7) total number of flexibility elements in the parental leave system (calculated as a total of flexibility elements in all three types of leave).

The elements of the leave flexibility explored are presented in Table 1.

**Tab. 1: The elements of the leave flexibility**

| Number | Maternal Leave | Parental Leave | Paternal Leave |
|---|---|---|---|
| 1 | Opportunity to take additional leave in case of medical complications and giving birth to multiple children | | |
| 2 | Opportunity to adjust leave days to one's own needs (i.e., to take leave at any time within a certain period after giving birth) | | |
| 3 | Opportunity to adjust the relationship between the level of the leave benefit and its duration (i.e., to receive higher benefits while taking shorter leave and lower benefits while taking longer leave) | | |
| 4 | | Opportunity to divide leave into parts | |
| 5 | Opportunity to extend leave if the mother works part-time | Opportunity to work part-time | |
| 6 | Opportunity to transfer a part of leave to the father of the child | Opportunity to transfer a part of leave to some other person (not a parent) | |
| 7 | | Opportunity to use entire leave by two parents simultaneously | |
| 8 | | Opportunity to use a part of leave by two parents simultaneously | |
| 9 | | | Extending leave if the mother has a disability or dies |
| Total number of flexibility elements analysed in parental leave policies | 5 | 8 | 5 |

Source: Koslowski et al, 2020

To avoid including mutually correlated variables in the cluster analysis, we evaluated whether they were collinear before the analysis using the correlation analysis based on the Spearman's rank correlation coefficient. After that, we standardised variables selected for the cluster analysis—adjusted them to the 0-to-1 range. For the cluster analysis, we used a hierarchical method (the Squared Euclidean distance and Ward's method) and k-means while ensuring that the clusters found are stable. To decide on the number of clusters, we analysed a dendrogram and the agglomeration schedule and took into consideration the size of the cluster. The significance of differences in cluster centroids was checked with the non-parametric criterion—Kruskal-Wallis Test.

Next, the clusters found were profiled through other variables which were not included in the cluster analysis. We explored the differentiation of clusters by two groups of indicators: 1) TFR and its dynamics for various time periods; 2) additional indicators which characterise parental leave systems. We compared groups of countries based on the Kruskal-Wallis Test; for nominal variables, we compared proportions of contingency tables' columns using the Z-criterion and Cramer's V.

The analysis was conducted in IBM SPSS Statistics 23.0.

## 2 Results

Our research obtained the following results.

1) The analysis of countries' variability by the indicators explored demonstrated a high differentiation (Table 2), which justifies using the cluster analysis and identifying groups of countries which differ by the parental leave policy.

**Tab. 2: Minimum and Maximum Countries' Levels of Indicators Studied**

| Variable | Minimum | Maximum |
|---|---|---|
| Total duration of post-natal leave, months | 0 | 12 |
| Total duration of parental leave, months | 0 | 120 |
| Duration of paternal leave, days | 0 | 112 |
| Number of flexibility elements in maternal leave | 0 | 2 |
| Number of flexibility elements in parental leave | 0 | 8 |
| Number of flexibility elements in paternal leave | 0 | 3 |
| Total number of flexibility elements in the parental leave system | 0 | 10 |

Source: Koslowski et al, 2020

The correlation analysis showed that some variables were collinear. To avoid the possible bias of the cluster analysis results, we selected one variable of the leave duration and one variable which characterises the flexibility of the parental leave system; these two variables were unrelated. Thus, the cluster analysis was conducted through the following variables:

- duration of the post-natal leave;
- total number of flexibility elements in the parental leave policy.

2) We found four clusters of countries (Table 3), two of which (Clusters 1 and 4) almost mirrored each other in terms of the maximum/minimum duration of post-natal leave and, accordingly, minimum/maximum opportunities for flexibility elements in the leave system. Cluster 2 yielded the low average leave duration and the low average number of flexibility elements; in Cluster 3, these values are mean. Table 4 evaluates the statistical significance of differences between clusters.

**Tab. 3: Descriptive Statistics by Clusters**

| Statistical Indicators | Cluster 1 | Cluster 2 | Cluster 3 | Cluster 4 |
|---|---|---|---|---|
| **Number of countries** | 5 | 16 | 17 | 9 |
| **Total duration of post-natal leave, months** | | | | |
| - mean | 10.56 | 2.08 | 4.18 | 2.62 |
| - standard deviation | 1.68 | 1.73 | 1.42 | 1.74 |
| - median | **11.20** | **2.30** | **4.20** | **2.80** |
| - mode | 12.00 | 0.00 | 4.20 | 0.00 |
| - minimum | 8.30 | 0.00 | 1.90 | 0.00 |
| - maximum | 12.00 | 6.00 | 6.50 | 4.70 |
| **Total number of flexibility elements in all types of leave** | | | | |
| - mean | 3.00 | 2.31 | 5.06 | 8.44 |
| - standard deviation | 2.36 | 1.66 | 1.30 | 0.73 |
| - median | **2.00** | **2.00** | **5.00** | **8.00** |
| - mode | 1.00 | 2.00 | - | 8.00 |
| - minimum | 1.00 | 0.00 | 3.00 | 8.00 |
| - maximum | 6.00 | 5.00 | 7.00 | 10.00 |

Source: authors' calculations

**Tab. 4: Evaluation of Significance of Statistical Differences between Clusters by Clustering Variables: Kruskal-Wallis Test**

| | Total Duration of Post-natal Leave, Months | Total Number of Flexibility Elements in All Types of Leave |
|---|---|---|
| Chi-Square | 22.508 | 31.825 |
| df | 3 | 3 |
| Asymp. Sig. | 0.000 | 0.000 |

Source: authors' calculations

3) On evaluating TFRs, their medians, and dynamic indices in these clusters, we did not find any statistically significant differences (Table 5).

**Tab. 5: Evaluation of Significance of Statistical Differences between Clusters by TFRs: Kruskal-Wallis Test**

| | TFR 2019 | 2000-2019 Increase in TFR | 2015-2019 Increase in TFR | 2015-2019 Median TFR | 2015-2019 Mean TFR |
|---|---|---|---|---|---|
| Chi-Square | 4.857 | 2.295 | 1.519 | 4.283 | 4.441 |
| df | 3 | 3 | 3 | 3 | 3 |
| Asymp. Sig. | 0.183 | 0.392 | 0.678 | 0.232 | 0.218 |

Source: The World Bank; authors' calculations

At the same time, they were found for a number of additional parameters which characterise the parental leave system. Table 6 presents those flexibility elements of the parental leave system which differentiate clusters of countries most clearly—they are related to a more or less bigger number of certain parental and paternal leave instruments in certain clusters.

**Tab. 6: Additional Variables Characterising Parental Leave System by Clusters**

| Variables | Clusters | | | | Cramer's V | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | Value | Asymp. Sig. |
| Opportunity to work part-time while on leave | 0 | 31,3% | 52,9% | 88,9% | 0.518 | 0.006 |
| Opportunity to divide parental leave into parts | 40,0% | 25,0% | 64,7% | 100,0% | 0.552 | 0.003 |
| Opportunity to adjust parental leave days to one's own needs | 40,0% | 18,8% | 47,1% | 77,8% | 0.424 | 0.038 |
| Opportunity to use entire leave by two parents simultaneously | 40,0% | 31,3% | 52,9% | 88,9% | 0.411 | 0.047 |
| Opportunity to transfer a part of maternity leave to the father | 60,0% | 0 | 23,5% | 11,1% | 0.474 | 0.014 |
| Positive changes in paternal leave in 2020-2021 | 100,0% | 93,8% | 82,4% | 44,4% | 0.476 | 0.014 |

Source: authors' calculations

# 3 Discussion

Our results leave much room for discussion with the special focus on characteristics of clusters. In particular, countries with the longest post-natal leave have the smallest number of flexibility elements in all types of parental leave and vice versa. We suggest that Cluster 1, where women have long post-natal leave, maintains a traditional distribution of roles, when women are mostly busy with raising children. If women bear a heavy household burden during long post-natal leave, there is no need for the country to make leave systems more flexible; therefore, countries with a flexible parental leave system (Cluster 4) prevent women from professional development to a lesser extent. Cluster 2 with low leave duration and poor flexibility of the system is likely to pursue a family policy less proactively; alternatively, there might be some other state family support measures or substantial help coming from the family, for example, the active engagement of grandparents into raising grandchildren.

Partially, our explanation proves itself in certain parental leave flexibility elements in the clusters. Cluster 1 (where post-natal leave is long) does not provide a legal opportunity to work part-time (Table 6), which is likely to suggest that women devote themselves to household chores and family responsibilities. The concentration of parental duties is also evident in the countries with short maternity leave and poor flexibility of the parental leave system (Cluster

2), which do not allow transferring a part of maternity leave to the father. However, parental leave systems in these two clusters do not stagnate, they are being vigorously developed, which is testified by changes in paternal leave. Countries from Cluster 4 with the lowest maternal leave and the best opportunities for the leave system flexibility naturally outnumber other clusters by a set of parameters; unexpectedly, though, only few countries in this cluster allow transferring a part of maternity leave to the father. This cluster provides for a number of flexibility elements (an opportunity to work part-time, to divide leave into parts, and to use parental leave by two parents simultaneously), which may encourage women to resume their career; thus, it may be less relevant for women to transfer a part of their leave for ensuring their professional development.

## Conclusion

Our results provide insight into the differentiation of parental leave policies in different countries. They show that a parental leave system itself does not predetermine birth rates or their dynamics. Rather, this policy becomes a part of a broader social and economic agenda, which enables meeting goals of state social and economic policies through support measures for families.

## Acknowledgment

This work is supported by the Russian Science Foundation under grant № 22-28-01847, https://rscf.ru/project/22-28-01847/

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