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Policy complementarity or substitution? The joint employment effects of active labor market policy and early childhood education and care

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Abstract

Scholars have long argued that social policies affect people's employment chances in interconnected ways, where a given policy intervention might have employment effects that are strengthened or dampened by other interventions. This article theorizes and empirically assesses how national active labor market polices (ALMP) and early childhood education and care (ECEC) interact in affecting individuals' employment chances. The objective is to address scholarly controversy over whether this policy interaction entails complementarity, substitution, or non-interaction. Analyses draw on EU-SILC individual-level true-panel survey data 2005–2019 from twenty-six European countries and aggregate policy indicators. Results show that ALMP and ECEC have complementary positive implications for employment probability among individuals with children, especially women. ALMP effort tends to have a more positive association with employment probability as ECEC effort becomes more substantial, and vice versa. Such patterns remain after controlling for individual characteristics, previous year's employment status, country fixed effects, and macro-economic conditions.

Key words: labor market institutions; social policy; institutional complementarity; employment; family; Europe.

JEL classification: H53 government expenditures and welfare programs; I38 welfare, well-being, and poverty: government policy; provision and effects of welfare programs; J21 labor and demographic economics: labor force and employment, size, and structure

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1. Introduction

Scholars and policymakers have long been conscious of the possibility that different policies interact in their effects on society (Orszag and Snower 1998; Hall and Soskice 2001; Crouch et al., 2005; Höpner 2005; Hall and Gingerich 2009; Crouch 2010; Hemerijck 2017). Contemporary welfare state researchers increasingly underline that social policies work in interconnected ways and highlight the possibility that effects of one social policy may vary depending on other policies in place (Yerkes et al., 2022; Hemerijck et al., 2023). An important example of such a possibility concerns two crucial policy interventions associated with "social investment" aspects of welfare states: active labor market policies (ALMP) providing job-relocation, training, and other employment assistance; and Early-Childhood Education and Care (ECEC) policies providing childcare or education assistance for pre-school children.

A rich literature provides evidence that ALMP programs tend to improve individuals' employment chances (Bonoli 2013; Brown and Koettl 2015; Card et al., 2018), though the effect-size varies by program type, risk group, and national context (Crépon and Van Den Berg 2016; Bonoli and Liechti 2018; Vooren et al., 2019; Yehati et al., 2019). Some meta-analyses reveal ALMP programs to have small average effects, with modest or even negative short-term effects and more positive longer term impacts (Crépon and Van Den Berg 2016; Vooren et al., 2019). Likewise, generous ECEC tends to encourage employment among parents, especially mothers (Pettit and Hook 2009; Hegewisch and Gornick 2011; Boeckmann et al., 2015; Brady et al., 2020; ILO 2022). ECEC's positive effects on employment and wages have been found to be small in the first year after childbirth and larger thereafter, and relevant for mothers of all skill levels and national contexts (Halldén et al., 2016; Plavgo 2026). But other barriers remain to increased employment chances for parents, such as institutional and cultural barriers in labor markets (Vandenbroucke and Vleminckx 2011; Boeckmann et al., 2015; Seo 2023).

How these policies interact in promoting employment, and for which risk groups, is less understood. A few studies have investigated how ALMP and ECEC policies interact in their effects on aggregate employment rates (Bakker and Van Vliet 2022; Nieuwenhuis 2022) and individual employment probabilities (Hemerijck et al., 2016). The direction of the interaction, however, remains unclear—where policy interactions entail forces of *complementarity*, but also of *substitution*. On the one hand, some studies have found that ALMP and ECEC have mutually reinforcing *complementarity*, where the tendency of either policy investment to facilitate employment may be enhanced by investment in the other. For instance, enhanced labor-market access can more effectively facilitate the holding of a job if doing so can be combined with care duties (Hemerijck et al., 2016; Cukrowska-Torzewska 2017). On the other hand, studies have identified patterns of ALMP and ECEC entailing mutual *substitution*, where both policies promote employment but face diminishing marginal returns to any additional investment in the other policy (Bakker and Van Vliet 2022; Nieuwenhuis 2022). These possibilities are not mutually exclusive and may cancel one another out in the net. Social policy scholars and policymakers have identified better understanding of such policy synergies and tensions as a theoretical and practical priority (Yerkes et al., 2022; Hemerijck et al., 2023; Council of the European Union 2024).

This study seeks to clarify theoretically and empirically how ALMP and ECEC interact in their effects for employment among individuals with children, and to shed new empirical light on whether their joint effects entail complementarity, substitution, or non-interaction. The focus is not on how ALMP and ECEC jointly affect net employment rates at an aggregate level, but on how these policies jointly affect individuals' employment chances—particularly those of individuals with children.

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Studying such micro effects is important, regardless of whether they translate into particular macro-level employment rates. Parenthood increases the risk of lower household work intensity (Harkness et al., 2019) and increased work interruptions and income-loss particularly among mothers (Cooke 2014; Harkness 2016; Jalovaara and Fasang 2020). Employment withdrawal, even if temporary, is associated with loss of skills and occupational-downgrading upon return (Dex et al., 2008; Abendroth et al., 2014; Cooke 2014). Career interruptions can negatively affect one's economic independence, increase poverty risk, and intensify inequality in wages and retirement income (Möhring 2018; Möhring and Weiland 2022). At a macro level, these mechanisms can erode the tax base and fiscal sustainability of welfare states, and lead to skill shortages. Hence, studying policy effects on individual-level employment chances is important.

Drawing on the policy complementarities scholarship (Hall and Soskice 2001; Crouch et al., 2005; Hall and Gingerich 2009; Hemerijck et al., 2023), our general expectation is that when it comes to how ALMP and ECEC jointly shape an individual's employment probability the forces of complementarity ought to be more powerful than the forces of substitution. Our study is an empirical exploration of this expectation, by analyzing employment experiences among individuals with children tracked over time in EU-SILC panel data. This approach is conceptually and methodologically different from previous studies that analyze ALMP-ECEC interaction effects on aggregate employment rates. Our true-panel setup allows more control on individual-level conditions—including an individual's past employment status—that can confound identification of how aggregate policy provisions influence employment probabilities.

Our analyses are based on multilevel models with more than 800,000 repeated observations from 381 surveys nested in individuals nested in a panel of twenty-six European countries. The resulting estimates point to a substantial complementary role of ALMP and ECEC policies in boosting employment chances among individuals with children, particularly among women with small children. For the female workforce with children, employment probability increases at higher spending efforts of ALMP and ECEC only when the two policy interventions are combined. Policy effects are weak when spending is concentrated only on one but not the other policy. For the male workforce with children, employment probability tends to increase with higher ALMP spending effort, and this effect does not vary by level of ECEC efforts except when focusing on whether respondents are employed versus inactive (as opposed to unemployed), in which case ALMP and ECEC tend to be complementary in enhancing employment and reducing inactivity also among men. These patterns of complementarity occur regardless of methodological choices with respect to country fixed effects, policy time lags, nesting decisions, and operationalization choices. The analyses provide no evidence that joint ALMP and ECEC spending efforts trigger diminishing marginal effects in individuals' employment chances.

2. Policy complementarity and substitution in social policy

In the study of political economy, a commonplace intuition is that policies and institutions interact in their effects. One example is the "Varieties of Capitalism" focus on "institutional complementarities" that distinguish liberal-market economies from their coordinated-market counterparts (Hall and Soskice 2001). Such interactions or complementarities, however, mean very different things to different scholars. For some, complementarity resides in how policies/institutions affect one another, through functional spill-overs (Aoki 1994), and for others in how policies/institutions have effects (for employment, growth, etc.) that involve their cumulative *combinations* (Orszag and Snower 1998; Crouch et al., 2005; Höpner 2005; Hall and Gingerich 2009; Crouch 2010). Policy or

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institutional interactions also reside in how distinct programs can moderate the effects of one another. Such interaction may involve complementarity, where " ... the co-existence (within a given system) of two or more institutions mutually enhances the performance contribution of each individual institution ... " (Deeg 2007: 611). Importantly, interaction need not entail complementarity but instead its opposite: *substitution*, where policies mutually offset one another's intended or unintended performance.

In studies of welfare states, the social investment approach has long suggested that policy interventions have effects moderated by other interventions (Esping-Andersen et al., 2002; Leoni 2016; Dräbing and Nelson 2017; Hemerijck et al., 2023; Plavgo 2023). Some scholars have found that unemployment insurance and ALMP interact in their employment effects: unemployment insurance may increase reservation wages that unintentionally foster unemployment, while ALMP provisions significantly dampen this effect by facilitating employment activation (Bassanini and Duval 2009; Benda et al., 2020; Pignatti and Van Belle 2021). Others have found complementarity between ALMP and other policies, e.g. that employment effects of ALMP are more positive when educational investments are higher (Plavgo 2023).

Focusing on programs *within* a policy realm (e.g. aspects of ALMP), scholars have found contrasting directions of interaction. Some scholars have found that different components of ALMP—such as training provisions, versus job-search provisions, versus public employment —tend to promote employment but entail diminishing marginal returns showing up as negative interaction among ALMP components (Fredriksson 2021). Within family policy, some scholars have found paid leave provisions and ECEC provisions to complement one another's spurring of parental employment (Cukrowska-Torzewska 2017). But other studies have found certain family policies can trigger trade-offs for male and female employment, with adverse consequences for female employment (Pettit and Hook 2009; see review by Brady et al., 2020).

Attention to policy interaction also extends to studies of employment effects between policy domains, such as between ALMP and ECEC policies—key touchstones of social investment provisions. Both ALMP and ECEC have been found to have direct (non-moderated) and generally positive employment effects. ALMP facilitating (re)insertion and activation in labor markets (Brown and Koettl 2015; Crépon and Van Den Berg 2016; Bonoli and Liechti 2018; Card et al., 2018; Vooren et al., 2019), and ECEC supporting work-care reconciliation through education and care assistance (Hegewisch and Gornick 2011; Boeckmann et al., 2015; Brady et al., 2020; ILO 2022). The size of such generally positive effects are sometimes small and can vary strongly, depending on program type, risk-group, and national context (Vandenbroucke and Vleminckx 2011; Crépon and Van Den Berg 2016; Vooren et al., 2019; Plavgo 2026).

Importantly, however, some studies have found that ALMP and ECEC might moderate one another's (positive) implications for employment. Hemerijck et al. (2016) argued that ALMP and ECEC tend to be complementary in their employment promotion, based on micro-level patterns of individual employment. They reasoned that for many people, taking advantage of ALMP to find and keep a job is facilitated by more generous ECEC provisions. Two other studies of ALMP-ECEC interaction, however, have focused on aggregate country-year employment rates and found a pattern of substitution, whereby ALMP's (ECEC's) positive employment effects tend to be negatively moderated by ECEC (ALMP) (Bakker and Van Vliet 2022; Nieuwenhuis 2022). They find diminishing marginal returns to (further) policy investments: Either policy's employment benefits are harder to achieve after a certain level of implementation of the other policy or after a certain rate of employment has already been reached. Such disparate findings likely reflect different estimation strategies and levels of analysis, where focusing on either individuals' employment chances or aggregate patterns of

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employment rates tap into different aspects of policy interactions. In any event, it is the micro-level focus that has received the least attention.

2.1 Argument and hypotheses

In light of these discrepant findings and paucity of individual-level evidence, our study more fully articulates the theoretical and empirical elements of how ALMP and ECEC interact in shaping individual-level employment. Theoretically, our expectations derive from specified micro mechanisms linking macro-policies in country contexts to individuals' employment chances (see also Hemerijck et al. 2016, Bakker and Van Vliet 2022, Nieuwenhuis 2022). ALMP can be expected to have significant individual-level employment effects that are positively enhanced by *or* negatively diminished by ECEC provisions that individuals can access. Similarly, ECEC might affect employment chances in some ways positively moderated by ALMP and other ways negatively. We consider such off-setting forces of complementarity, substitution, and non-interaction, and then articulate our expectation that complementarity should predominate with respect to micro-level individual chances of employment.

2.1.1 Complementarity

Either ALMP or ECEC can promote individuals' employment in ways promoted by the other. This expectation builds on the logic of the institutional complementarities scholarship (Hall and Soskice 2001; Crouch et al., 2005; Hall and Gingerich 2009; Hemerijck et al., 2023), particularly the "life course multiplier" concept (Hemerijck 2017) where social investment policies "overlap and perform in an interconnected fashion" (Hemerijck et al., 2023: 485). We expect exactly this with ALMP and ECEC, through three distinct logics of complementarity for individual employment chances, particularly holding for parents of small children.

The first logic involves the intended employment functions of ALMP and ECEC provisions. ALMP may offer training, job-search, job-relocation, subsidized labor schemes, start-up subsidies, and/or public employment schemes regardless of ECEC provisions. But being able or choosing to be in the labor force and use such ALMP provisions is likely helped by public ECEC provisions for combining employment with family duties (Hegewisch and Gornick 2011; Cukrowska-Torzewska 2017). In the absence of affordable, high-quality ECEC services, parents may be less likely to take up ALMP even in the most generous ALMP contexts. In such cases, higher ALMP may have little employment-enhancing effect among individuals *with* care responsibilities. And it could even diminish employment prospects if ALMPs are taken up only by individuals *without* care responsibilities, hastening the latter's employment but *diminish* job opportunities for others not receiving assistance (Crépon and Van Den Berg 2016: 534).

A similar logic of complementarity applies to the employment-promoting effects of ECEC. Extensive evidence shows that parents—especially mothers—face elevated risks of labor market withdrawal and wage penalties following childbirth, and that the magnitude of these penalties varies across welfare states (Cooke 2014; Boeckmann et al., 2015; Jalovaara and Fasang 2020). Higher public investments in ECEC are expected to mitigate these parenthood penalties through two main mechanisms.

First, high childcare costs tend to reduce labor-supply incentives, particularly for the parent with lower expected earnings relative to their partner (Blau and Kahn 2017). Public investments in ECEC can lower this supply-side barrier by reducing the opportunity costs of parental—especially maternal—employment. Second, parenthood may reduce hiring prospects due to employers' perceptions that parents, especially mothers, are less committed and more prone to work interruptions due to care responsibilities (Blau and Kahn 2017). Greater ECEC availability can alleviate this demand-side barrier by facilitating more regular work schedules.

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Longitudinal empirical evidence supports these expectations, showing that higher public ECEC investments promote parents' re-entry into employment and reduce wage penalties, particularly from the second year after childbirth (Halldén et al., 2016; Plavgo 2026). However, ECEC provision alone may be insufficient to ensure sustained employment attachment, especially for parents at risk of unemployment or inactivity. Parents who rely on ECEC are therefore likely better able to find and retain employment when ALMP provisions are in place to enhance skills and facilitate transitions from inactivity or unemployment into work.

To be sure, only a few ALMP programs target parents or women (Yehati et al., 2019), and access to ALMP participation may be harder for those with care duties. Yet, some studies have found no gender differences in effectiveness of ALMP (Vooren et al., 2019; Yehati et al., 2019), while others have found ALMP effects to be greater for women than men (Bergemann and Van den Berg 2008). Hence, ALMP programs found to have the greatest employment impact—wage subsidies, independent-worker assistance, support to micro-entrepreneurs and vocational training programs—are likely beneficial for parents with children as much as any other citizens (Crépon and Van Den Berg 2016; Yehati et al., 2019). Such ALMP provisions can hence be expected to enhance ECEC's employment facilitation among those with small children—a logic of complementarity. In the absence of ALMP, ECEC may still help particularly mothers reconcile work and care, but finding, creating or retaining a job for ECEC beneficiaries may require additional support that ALMP distinctly provides.

Another complementarity mechanism involves a threat effect of activating social policies, especially relevant to programs matching job seekers with job vacancies (Filges and Hansen 2017). When benefits for job seekers are made conditional upon active job search, monitoring, and possible sanctions, ALMP can make being unemployed or inactive less attractive, and increase reemployment incentives (Crépon and Van Den Berg 2016). This conditionality may apply also to parents, but the willingness and possibility of reemployment likely depends on parents' options to reconcile work with (quality) care duties—options improved with ECEC.

A final complementarity mechanism involves how ECEC and ALMP provisions both send signals encouraging broad ideational and cultural embrace of employment as appropriate for oneself and one's family. Government communication about activation and work-care reconciliation operate through labor law and policy reforms, and related policy-justifications in public discourse. How public spending is portrayed in government communication varies across countries and time, but there is a discernible trend toward emphasizing socio-economic investments (Cavalieri and Karremans 2024; Di Carlo et al., 2025). And given that cultural support for maternal employment appears to spur actual maternal employment (Boeckmann et al., 2015; Seo 2023), policy discourse favoring increased employment among specific risk groups (e.g. women with young children) has positive effects on self-selection among these groups into employment. Policy discourse accompanying and selling both ALMP and ECEC as social investment provisions can compound their employment-friendly complementarity.

2.1.2 Substitution

Interactions in how ALMP and ECEC affect employment chances can also involve substitution rather than complementarity. Relevant for the same target populations, ALMP and ECEC might positively affect employment but with decreasing marginal returns. This logic applies most obviously to aggregate, macro-level patterns of employment rates: when employment rates are already high, promoting employment of the remaining inactive or unemployed persons may be more costly marginally and require policies other than ALMP or ECEC; so a ceiling-effect emerges as employment rates

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approach saturation, yielding diminishing marginal returns. Forces of substitution may apply also for a given benefit recipient. If one benefits from ALMP to get a job, a marginal increase in ECEC may substitute for employment enhancement. Similarly, if one benefits from ECEC to get or to keep a job, the marginal positive employment effect of further ECEC may be smaller amidst ALMP provisions already facilitating employment.

Beyond diminishing marginal returns is the possibility that particular features of ALMP and ECEC foster substitution. Some activating policies may have a lock-in effect, discouraging workers to search for regular jobs (van Ours 2004). In some contexts, ALMPs subsidize employers to use participants as temporary cheap labor (Martin and Swank 2012). Such effects can negatively interact with work—care reconciliation policies, whereby more generous ALMP steers some groups of ECEC to access childcare and training programs but not enter stable employment. Similarly, more generous ECEC could facilitate entering the labor force, but only by using ALMP provisions (e.g. training) without actually entering regular work. Any combination of these mechanisms can yield a substitution effect, where ALMP's tendency to promote employment might be negatively rather than positively moderated by more generous ECECs, and vice versa.

2.1.3 Non-interaction

A final possibility is that ALMP and ECEC efforts have no net interaction effect on individuals' employment likelihood. If ALMP provisions and ECEC provisions get taken up by very different target populations, then at the level of a given individual the effectiveness of one employment-promoting policy should not alter the effectiveness of the other. Or if both policies get taken up by a given individual and both the complementary and substitution logics shape policy interaction, then ALMP and ECEC should confer employment benefits that are neither diminished nor spurred by the other policy.

2.1.4 Hypotheses

How these logics play out is uncertain *a priori*, but our focus on micro-level individual employment probabilities (as opposed to macro-level employment rates) is likely to highlight the possible forces of complementarity. We expect this to be the case in how ECEC conditions the ALMP effect on employment and in how ALMP conditions the ECEC effect on employment—particularly for parents and (particularly still) for mothers of small children. ALMP provision is directly aimed at increasing or preserving employment, and the extent to which parents can benefit from ALMP participation and commit to regular employment depends on work—care reconciliation provisions, entailing strong complementarity. ECEC provisions are likely to increase employability also among those who do not need ALMP provision but are more likely to have stronger positive employment-effect when those needing additional job (re)insertion or initial employment can benefit from such labor provisions. Activation-supportive programs also send signals that shape public attitudes and increase support of an individual employment take-up, hastening parents' self-selection into employment, especially among women with younger children. For these reasons, our analyses of individual employment patterns focus on a two-fold hypothesis of complementarity:

> H1a: More substantial ALMP provisions are likely to be associated with higher chances of employment among individuals in settings with more substantial ECEC provisions.
>
> H1b: More substantial ECEC provisions are likely to be associated with higher chances of employment among individuals in settings with more substantial ALMP provisions.

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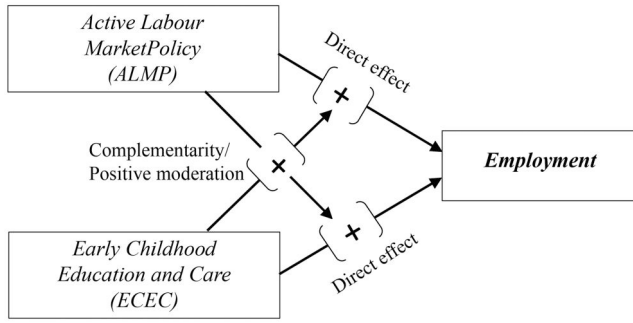

Figure 1. Hypothesized complementarity in the employment effects of ALMP and ECEC.
Source: authors' elaboration.

Since ECEC services target preschool children and are especially important for increasing employment chances among mothers (Hegewisch and Gornick 2011), we expect ALMP-ECEC complementarity to be stronger for women and for those with smaller children:

> H2: The complementarity dynamics summarized in H1a and H1b should be stronger for the female compared to male parents in the workforce, and stronger still for females with preschool children.

Figure 1 graphically summarizes these expectations. People in settings characterized by more substantial ALMP provisions are more likely to be employed than those in less substantial ALMP settings (direct ALMP effect in Fig. 1). And that expected positive effect is likely enhanced, particularly for mothers of small children, by being in settings with more substantial ECEC provisions (complementarity/positive interaction in Fig. 1). Likewise, those in settings with more generous ECEC ought to, ceteris paribus, spur employment chances (direct ECEC effect in Fig. 1). And this dynamic ought to be enhanced in settings with more substantial ALMP interventions (complementarity/positive interaction in Fig. 1).

3. Research design

The rest of this article explores empirically how ALMP-ECEC interaction is associated with individuals' employment status. Ideally, we would explore this using representative micro-level data on measured participation in ALMP and ECEC provisions, tracking how participation plays out for employment—or better still, where one could experimentally manipulate participation in ALMP and ECEC provisions. Lacking such data, we pursue a next-best research strategy: Building on the micro-level design of Hemerijck et al. (2016), we analyze high-quality micro-level (true) panel data on individuals' labor-market status, tracked over multiple years and countries, matching these individual data to country-year information on ALMP and ECEC policy effort. This allows us to model unobserved heterogeneity across countries *and* individuals, and strongly control for a range of individual-level characteristics, including past employment, that helps address endogeneity bias, omitted variable bias and selection-into-treatment that threaten inferences on social investment interactions. The approach also allows us to control for possible aggregate confounders, relevant given that our ALMP and ECEC measures are country-year level aggregates. We include time-varying controls that capture key national macro-economic conditions, demographic conditions, social protection generosity, family

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cash benefit generosity, and paid parental leave duration, all of which can influence ALMP and ECEC effort and are relevant for labor-market demand and supply for parents. We also consider fixed-effects models that control for time-invariant country-level conditions. Potential biases can still challenge our inferences, of course, but our estimation approach does a lot to minimize biases within the limits of our observational data.

3.1 Data and variables

Our analyses draw on longitudinal microdata from Eurostat, EU Statistics on Income and Living Conditions (EU-SILC) from 2003 to 2019. We merged data from all European countries with available longitudinal EU-SILC data using the eusilcpanel_2020 script written by Borst and Wirth (2022) and provided by GESIS. These data were combined with aggregate macro-level indicators on social policy spending and other macroeconomic and demographic conditions retrieved from the Organisation for Economic Co-operation and Development (OECD) database, Eurostat, and the World Bank Databank. The merged dataset comprises individuals from twenty-six European countries, with 5 to 17 survey years per country, totaling hundreds-of-thousands of respondents in 381 country-year observations. Table A.1 lists the analyzed countries and years.

For our baseline analyses, we restrict the sample to working-age individuals aged 20 to 55 living in households with children under age 18, 10, and 5, respectively. EU-SILC longitudinal data follow individuals for up to four years. Our baseline estimates control for individuals' employment status in the previous survey year; therefore, we exclude individuals observed only once (6.8 per cent) as well as first survey-year observations, for which lagged information is not available. The resulting sample of adults with children contains 807,448 repeated person-year observations for 327,084 individuals across twenty-six countries, each observed for up to four years. The subsample of adults with children under age 5 contains 285,016 person-year observations and 132,493 individuals.

Employed—our main dependent variable—is measured using self-defined current economic status and expressed as a binary indicator: 1 if a person is in employment, comprising full-time and part-time employees and self-employed, and 0 if not in employment, comprising unemployed and inactive individuals, as well as those fulfilling domestic tasks and care. This baseline measure excludes individuals in education or training, retirement, permanent disability, or unfitness to work, and those in compulsory community or military service (7.8 percent of the sample with children). In the resulting sample, 81 percent are in employment, 8 percent unemployed, and 11 percent inactive (76, 8, and 16 percent, respectively, among those with children under age 5). Defined in this way, employment status varies over time, with 25 percent initially unemployed or inactive transitioning into employment during the observation period.

A limitation concerns classification of parents on parental leave in EU-SILC, which has no distinct category for parental leave in the survey. Respondents classify themselves according to their perceived main activity. So parents with very young children may report being employed—particularly when leave durations are short or job attachment strong—or may instead report their main activity as fulfilling domestic and care responsibilities and thus be coded as inactive. The self-defined *Employed* status should therefore be interpreted as capturing labor-market attachment, including possible temporary work absences. Transitions into employment may in some cases reflect returns from parental leave, with ambiguous connection to policy changes. To assess the robustness of our findings to this potential measurement ambiguity, we conduct sensitivity analyses excluding parents with very young children (see section 4.1 on sensitivity analyses for details).

Our robustness analysis considers an alternative, more encompassing measure of economic activity, *Employed, in Education or Training (EET)*, which classifies individuals in education or training as

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active (in addition to those in employment), while treating those in (early) retirement as inactive (alongside the unemployed and otherwise inactive individuals). Using this definition, 81 percent of observations are "active," comprising 77.5 percent employed and 3.5 percent in education or training. The remaining 19 percent are "inactive," including 8 percent unemployed, 10.6 percent otherwise inactive, and 0.4 percent retired.

Finally, auxiliary analyses consider measures of *Employment Quality*, defined as holding a permanent (rather than fixed term) contract and working reasonable hours. We operationalize the latter using thresholds of fewer than 61, 51, and 41 hours per week. These indicators are simplified proxies for employment quality, as more detailed information on job characteristics is unavailable in the EU-SILC longitudinal data.

ALMP policy effort is measured using public ALMP expenditure as a percentage of GDP and adjusted for the target population. The spending data were retrieved from Eurostat for most countries (Eurostat 2025) and the OECD social protection database for Iceland and Switzerland (OECD 2022a). These data comprise expenditures on public employment services, training, employment incentives, supported employment and rehabilitation, direct job creation, and start-up incentives (LMP categories 1-7). To adjust for the target population, ALMP spending as a percentage of GDP is divided by the percentage of unemployed persons aged 20–64 in each observation-year. The unemployment rate is a proxy for the size of the target population since the largest share of ALMP provisions in Europe is targeted at unemployed persons (European Commission 2021). Such adjustment for unemployment has also informed other empirical studies of (country-year) social investment policies (Hemerijck et al., 2016; Ronchi 2018; Bakker and Van Vliet 2022; Nieuwenhuis 2022). We note, however, that countries' ALMP programs differ in the target population, with some targeting mainly unemployed persons, others also the inactive population as well as employed persons at risk of withdrawal. Our baseline and alternative estimations, such as those including alternative measures of "employed" and/or country fixed effects, go some distance to address such differences in our analyses.

ECEC policy effort is measured using data on public expenditure (as a percentage of GDP) on early childhood education and care services, again adjusted for target population. The ECEC expenditures draw from the OECD Family Database (OECD 2025a) and include all public spending toward formal day-care services, generally aimed at children under 3 (day care centers and family day care) and pre-primary education services, usually for children aged from 3 to 5 inclusive (kindergartens and day-care centers). This measure is adjusted by dividing expenditures by the population share of children aged 0 to 5 (from the Eurostat population dataset).

Despite limitations in using expenditure data (Bakker and Van Vliet 2022), such adjusted ALMP and ECEC effort measures allow broader country and time coverage than alternatives such as generosity or take-up measures (Van Vliet and Wang 2015; Hemerijck et al., 2016). Equally important, these spending-effort measures provide widely used and comparable proxies of policy effort across countries and time. They do not directly capture access to or take-up of services, but they do so indirectly, particularly when adjusted for the size of the target population. As a complementary descriptive check, ALMP and ECEC spending are positively correlated with measures of policy take-up in Europe in the 2010s—the period on which we focus (see Figs A.1 and A.2).

Figure 2 plots the country-level association between our ALMP and ECEC measures, averaged over the analyzed period. While the two measures correlate (cor. = 0.55 at the country level, cor. = 0.47 at the country-year level), we see large cross-national variation in investments in one or the other measure. Some countries are low spenders on both measures (e.g. Greece, Estonia, Slovakia, Czech Republic, Portugal); a few are relatively high spenders on ALMPs but below-average on ECEC (Austria, Luxembourg); and some are high spenders on both policies (Denmark, Norway, Sweden).

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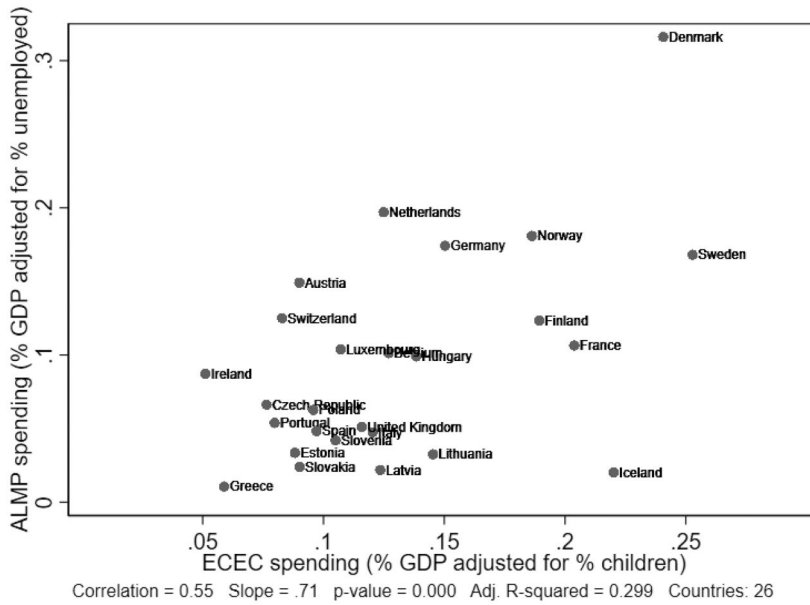

Figure 2. Association between ALMP and ECEC spending: country averages, 2003–2019.
Source: Authors' calculations using Eurostat Statistics, OECD social protection spending database, and OECD family database.

Each plotted country is followed for up to 17 years, capturing notable over-time variation in both measures, and providing substantial variation in ECEC-ALMP combinations (Table S1 [see online supplementary data for country-year values] and Figure S1 [see online supplementary data for the country-year associations]).

3.1.1 Controls

All estimates control for micro- and macro-level indicators to account for individual and national-contextual factors that may influence respondents' employment chances beyond ALMP and ECEC availability. Individual-level covariates include: *employment status in the previous year* using the same definition as above *(t-1)*; *age* at the interview; *household size* (the number of household members); *children under age 12 months* capturing presence of recently born children since employment probability in such households (especially for mothers) is lower due to maternity, paternity or parental leave; *health* (self-reported general health on a 1-to-5 scale from "very good" to "very bad"); *marital status* (1 if married and 0 otherwise); *educational attainment* indicating respondent's highest ISCED educational level, coded into four categories (no or primary, lower-secondary, upper-secondary, and tertiary education); and *poor* denoting poverty status in the previous year (the income reference period), expressed as a binary measure (1 for households with total equivalized disposable income <60 per cent of national median; 0 otherwise).

Macro-level controls include: *Unemployment rate* expressed as unemployed population as a percentage of total population between 20 and 64 years (Eurostat 2022); *GDP growth rate*, annual percentage growth rate of GDP at market prices based on constant local currency (World Bank Databank 2025); *Old-age dependency ratio*, the ratio of older dependents (aged 65+) to the working-

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age population (aged 15–64) (World Bank 2022); *Social spending*, total public social expenditure as a share of GDP, excluding spending on separately measured programs (ALMPs and ECEC) as well as pensions and survivors' benefits not directly targeted at the analyzed population (OECD 2022b); and *Public spending on family benefits in cash*, expressed as a percentage of GDP, capturing child-related cash transfers such as child allowances and income support during periods of parental leave (OECD 2025b). Robustness analyses also control for *length of paid maternity, parental and home care leave* available to mothers, measured in weeks (OECD 2025c). As data on parental leave policies are not available for all country-years in our sample, we do not include this measure in the baseline specification but instead consider it in robustness analyses.

Table A.2 provides descriptive statistics of all indicators in their original metric for the total sample. Table S2 (see online supplementary data) provides the same for a restricted sample of individuals with children under age 5.

3.2 Research strategy

To assess how ALMP and ECEC interact in shaping individual employment probabilities, we fit dynamic-panel random-intercept multilevel logistic regression models combining individual- and macro- level data. Our baseline models include a lagged dependent variable—an individual's employment status in previous survey year (*t-1)*—to control-away non-observed characteristics of a respondent's employment-related conditions and generally given that one's current employment status is a function of prior status. In econometric terms, such a lagged dependent variable helps address autocorrelation, omitted variable bias and possible selection-into-treatment (Shumway and Stoffer 2017; Wilkins 2018). Our two social investment spending measures are added as second-level conditions. The model is captured by Equation 1:

$$\begin{aligned}\text{logit}(\Pr(E_{icy}=1)) = {} & \beta_0 + \beta_1 \text{lag}E_{icy} + \beta_2 \mathrm{X}'_{icy} + \beta_3 \text{ALMP}_{cy} + \beta_4 \text{ECEC}_{cy} + \beta_5 (\text{ALMP}_{cy} \times \text{ECEC}_{cy}) \\ & + \beta_6 \mathrm{M}'_{cy} + u_c + u_{ic} + \varepsilon_{icy}\end{aligned} \tag{1}$$

The dependent variable E_{icy} is the employment status of individual i in country c and year y. The lagged employment indicator lagE_{icy} accounts for previous year's employment status. X'_{icy} is a vector of time-varying individual-level control variables. ALMP_{cy} and ECEC_{cy} are our population-adjusted measures of public spending on active labor market policies and early childhood education and care, respectively. Their interaction term captures potential complementarities between these two forms of social investment, with β_5 expected to be positive in case of complementarity and negative in case of substitution. M'_{cy} includes additional macro-level time-varying covariates. u_c represents random intercepts for countries. u_{ic} represents random intercepts for individuals. ε_{icy} is the residual term assumed to follow a logistic distribution.

Our baseline multilevel models are three-level random-intercept specifications. Level 1 represents repeated observations (person-years), nested within individuals (Level 2), and nested within countries (Level 3). Random intercepts are included at both the country and individual levels, and random effects are allowed to be correlated. The multilevel model specification is appropriate for cross-national longitudinal survey data with repeated observations and policy variables that vary at the country-year level (Fairbrother 2014). This structure accounts for within-individual and within-country clustering of observations when estimating standard errors. However, standard errors of macro-level variables may still be underestimated, not least due to the relatively small number of

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countries in Level 3 (Stegmueller 2013). Our baselines therefore use robust-cluster standard errors (clustering at country level).

This specification exploits the between-country and over-time variation in macro-level policy indicators while accounting for unobserved heterogeneity at both the country and individual levels. Doing so, however, risks remaining omitted-variable bias at the country level. So we also consider country fixed-effect models, dropping the country-level random intercepts and include country dummies to control-away all time-invariant country characteristics (see online Supplementary data for specifics). We also perform many robustness checks considering alternative specifications: e.g. models without the lagged dependent variable; with different control combinations; with time fixed effects; excluding unemployed or inactive respondents; excluding countries and country-groups; etc. Results are reported in sensitivity analyses, and full estimates are in the online Supplementary data.

4. Findings

We turn now to our findings. Table 1 presents results for *females* and *males* between age 20 and 55 with children under age 10 and under age 5. It reports estimates from our baseline mixed effects models showing predicted change in the odds of being employed, net of individual- and macro-level covariates. Models 1-3 report estimates for the female sample, and Models 4-6 for the male sample. Models 1 and 4 report the direct effects of ECEC and ALMP, and the rest of the models add the interaction between ECEC and ALMP. We also consider and discuss alternative estimates exploring the sensitivity and robustness of the results below. And results for the total sample with children under age 18 are available in Supplementary data.

Before reporting Table 1's main results for ECEC and ALMP effects, note that the individual- and country-year level controls perform in line with expectation, albeit with important gender differences. Respondents are more likely to be employed when having also been employed the previous year, when higher educated, older, living in smaller households, in good health, and not at-risk-of-poverty. Female respondents are more likely to be employed when not married, while male respondents when married; and female respondents are more likely to be employed without children born within the last year, while males' employment likelihood is not so affected. Regarding the macro context, individuals are more likely to be employed in settings with lower unemployment rates, especially for men (also women when excluding the inactive, see online Supplementary data). Also, men (not women) are more likely to be employed during times of economic growth, and women (but not men) are more likely to be employed in settings with lower levels of social spending and public spending on family benefits in cash.

The ALMP and ECEC effects, the focus of our analysis, vary strongly by gender. Higher public investments in ALMP are associated with higher individual employment likelihood among men, and higher public investments in ECEC are associated with higher employment likelihood among women. Holding other factors constant, the independent effects of ALMP and ECEC are generally small and estimated with limited statistical precision, although are larger when certain controls are omitted or within specific population subgroups (see Supplementary Material tables). For instance, the direct effect of ALMP increases when omitting control for poverty status, suggesting greater ALMP effectiveness among individuals at-risk-of-poverty. The direct effect of ECEC is particularly substantial and statistically significant when restricting the sample to women with children aged 1–4 and when employment quality is considered—capturing not only employment status but also permanent-contract arrangements and reasonable working hours (Table S7, see online supplementary data).

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Table 1. Predicted change in the odds of being employed among individuals with children in Europe.

	Female			Male		
	(1) child <10	(2) child <10	(3) child <5	(4) child <10	(5) child <10	(6) child <5
ECEC spending, std.	1.038	1.077	1.064	1.032	1.044	1.014
	(0.047)	(0.049)	(0.050)	(0.060)	(0.063)	(0.057)
ALMP spending, std.	0.949	0.957	0.974	1.080	1.077	1.079
	(0.034)	(0.029)	(0.034)	(0.064)	(0.061)	(0.069)
ECEC × ALMP		1.098*	1.145***		1.030	1.059
		(0.055)	(0.050)		(0.046)	(0.047)
Lag employed (t-1)	28.752***	28.730***	18.881***	24.413***	24.416***	21.353***
	(3.405)	(3.406)	(2.867)	(2.878)	(2.880)	(2.527)
Education: lower sec.	1.114	1.112	1.130	0.972	0.971	0.950
	(0.145)	(0.145)	(0.205)	(0.071)	(0.071)	(0.079)
Upper secondary	1.546***	1.542***	1.580**	1.383***	1.382***	1.371***
	(0.230)	(0.230)	(0.317)	(0.109)	(0.109)	(0.114)
Tertiary	2.094***	2.089***	2.157***	1.855***	1.854***	1.822***
	(0.330)	(0.331)	(0.461)	(0.182)	(0.182)	(0.185)
Age (centered)	1.022***	1.022***	1.027***	1.007***	1.007***	1.007***
	(0.005)	(0.005)	(0.006)	(0.002)	(0.002)	(0.003)
Household size	0.925***	0.925***	0.926***	0.927***	0.927***	0.908***
	(0.015)	(0.015)	(0.019)	(0.014)	(0.014)	(0.014)
Health (good-bad)	0.884***	0.884***	0.923***	0.727***	0.727***	0.753***
	(0.016)	(0.016)	(0.018)	(0.018)	(0.018)	(0.020)
Married	0.879***	0.878***	0.884***	1.575***	1.575***	1.482***
	(0.030)	(0.030)	(0.032)	(0.066)	(0.066)	(0.069)
Children aged 0	0.292***	0.291***	0.359***	0.955	0.955	0.958
	(0.054)	(0.054)	(0.054)	(0.030)	(0.030)	(0.028)
Poor (<60% median)	0.493***	0.493***	0.487***	0.377***	0.377***	0.374***
	(0.036)	(0.036)	(0.041)	(0.023)	(0.023)	(0.021)
Unemployment rate	0.995	0.993	0.999	0.951***	0.950***	0.946***
	(0.006)	(0.005)	(0.006)	(0.006)	(0.006)	(0.007)
GDP growth rate	0.999	1.000	0.994	1.034***	1.034***	1.037***
	(0.005)	(0.005)	(0.007)	(0.006)	(0.006)	(0.007)
Dependency ratio	1.010*	1.010*	1.013*	1.007	1.007	1.009
	(0.006)	(0.006)	(0.007)	(0.008)	(0.009)	(0.009)
Social protection	0.946***	0.946***	0.946**	0.969*	0.969*	0.989
	(0.019)	(0.018)	(0.022)	(0.017)	(0.017)	(0.013)
Family transfers	0.957	0.986	0.960	1.023	1.030	0.961
	(0.042)	(0.049)	(0.059)	(0.079)	(0.078)	(0.070)
Variance countries	0.256***	0.205***	0.307***	0.087*	0.079*	0.044**
	(0.079)	(0.065)	(0.099)	(0.045)	(0.043)	(0.021)
Variance individuals	0.000	0.000	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Number observations	267,305	267,305	150,508	234,101	234,101	134,508
Number individuals	112,381	112,381	70,251	98,300	98,300	62,242

continued

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Table 1. *Continued*

	Female			Male		
	(1) child <10	(2) child <10	(3) child <5	(4) child <10	(5) child <10	(6) child <5
Number countries	26	26	26	26	26	26
AIC	190994	190977	123728	81641	81642	48414
BIC	191194	191187	123927	81838	81849	48611

Source: Authors' calculations, pooled EU-SILC longitudinal survey data from 26 countries, and 381 surveys (2003–2019).
Notes: Estimates from multilevel mixed effects models expressed in odds ratios. Multilevel mixed effects logistic panel regression models. Robust-cluster standard errors (clustered by country) in parentheses. ALMP, active labor market policy; ECEC, early childhood education and care; GDP, gross domestic product.
$^{*}P < .1$, $^{**}P < .05$, $^{***}P < .01$.

The interaction estimates reported in Table 1 show a pattern of interaction between ECEC and ALMP that entails *policy complementarity*, but significantly so only for female respondents with children. This is recognizable by the odds ratio of >1 for the interaction-term *ALMP X ECEC* in models 2–3. The interaction effect is higher in magnitude and statistical certainty for women with younger compared to older children. Focusing on the *female workforce* with children under age five (model 3), the employment odds of respondents in contexts with higher ALMP spending effort are higher when ECEC effort is also higher (odds ratio 1.145, *P*-value < .01). This pattern supports hypothesis 1, that ECEC positively moderates ALMP's employment promotion and vice versa; and supports hypothesis 2, that such positive complementarity is stronger for women with small children.

To visualize this interaction and better understand its magnitude, Fig. 3 plots average marginal effects of how investments in one policy moderate the effectiveness of the other. The left-hand panel shows how the effect of ECEC is conditional on ALMP spending efforts. It plots the average marginal effects of ECEC on female employment probability across the ALMP distribution, and shows that, all else being equal, ECEC is more employment-enhancing in contexts with higher ALMP efforts. Higher ECEC efforts have nearly zero effects on female employment probability when ALMP is below-average, but the ECEC effect gradually increases with higher levels of ALMP spending effort. When ALMP effort is 2 standard deviations above the mean, higher ECEC effort is associated with around 5-percentage-point higher employment probability after accounting for individual- and macro-level covariates (7-percentage points higher among women with children aged 1–4, see Fig. A.3). Likewise, the right-hand panel shows how ALMP effects are conditional on ECEC efforts. At above-average levels of ECEC spending efforts, ALMP is positively associated with higher employment probability among women with children. At below-average levels of ECEC, by contrast, higher ALMP efforts are associated with a decreasing probability of being employed.

Supplemental analysis clarifies the substantive meaning of these results, and how the interactions play out for the advanced hypotheses. Consider first the patterns relevant to H1a on how ECEC moderates ALMP's employment promotion. Figure 4 plots predicted probabilities of being employed across the full sample distribution in ALMP spending for female and male respondents with children under age 5. The solid and dashed lines represent individuals from contexts with low and high ECEC effort, respectively. They show a clear pattern of the complementary role ECEC plays in moderating ALMP's association with employment for female respondents (left panel). In contexts with high ECEC spending (at the 90th percentile), employment probability among women with children

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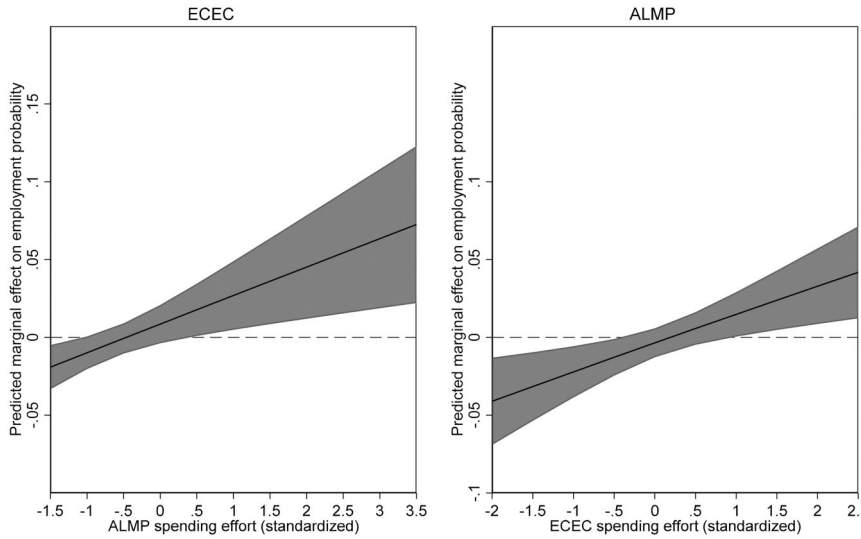

Figure 3. Average marginal effect plots of interaction between ALMP and ECEC on employment probability for women with children under age 5: ECEC effect conditional on ALMP efforts (left panel), and ALMP conditional on ECEC efforts (right panel).

Source: Authors' calculations using Eurostat EU-SILC longitudinal data 2003–2019. Full model in Table 1, Model 3.

Notes: Shades denote 95 per cent confidence intervals.

increases with higher ALMP effort, from 61 to 70 per cent across the ALMP distribution. By contrast, when ECEC spending is low (10th percentile), employment probability is overall lower and *decreases* with higher ALMP spending—from a predicted 65 to 53 per cent. Such patterns suggest that at low ECEC spending levels, ALMP might actually be unemployment- or inactivity-promoting for persons with children. This may reflect dynamics by which ALMP-enhanced employment take-up in settings with uncovered childcare responsibilities is concentrated among those without care responsibilities and comes at the expense of those with care duties. Overall, the results suggest that for women with children, ALMP's employment promotion is positively moderated by ECEC effort.

For fathers with small children (right panel), employment probability is substantially higher and increases somewhat further in contexts with high ALMP and ECEC spending effort (from 91 to 94 per cent), but the ECEC moderating effect is small and statistically insignificant.

Figure 5 uses the same models to clarify the pattern in how ALMP enhances ECEC's employment promotion (H1b). Here, we consider how the full-sample variation in public investment in ECEC plays out for an individual's employment probability at lower and higher ALMP effort. We again see the pattern of complementarity, where ECEC is employment-promoting only in settings with high ALMP effort levels. The left-hand panel (solid line) shows that ECEC's predicted effect on employment probability for mothers of small children is weak and slightly negative when ALMP effort is low (still weak but slightly positive for women with children aged 1 to 4, see Fig. A.4). In contrast, when ALMP effort is high the steeper dashed line shows the positive association between ECEC spending and mothers' employment, where the predicted employment probability increases with

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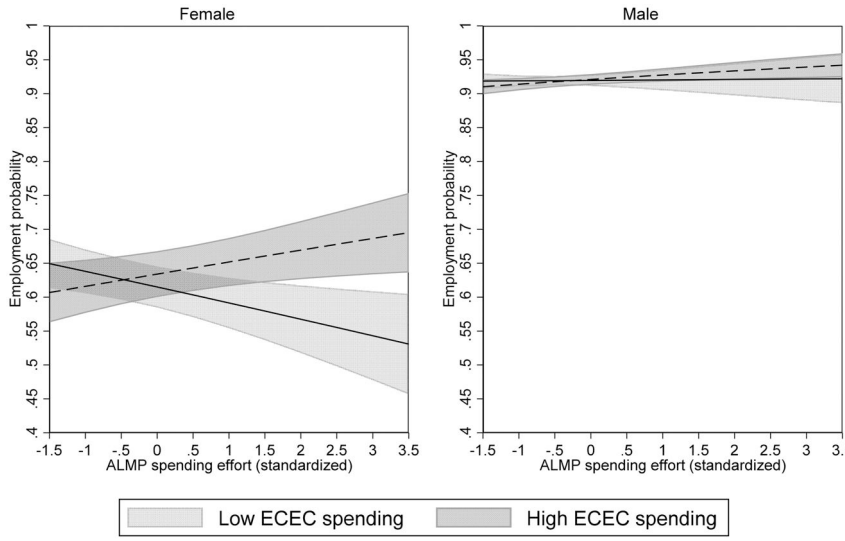

Figure 4. Predicted probability of employment across ALMP spending distribution, at low and high ECEC spending levels, for female and male workforce with children under age 5.

Source: Authors' calculations using Eurostat EU-SILC longitudinal data 2003–2019. Full models in Table 1.

Notes: Low/High ECEC spending at 10th and 90th percentile. Shades denote 95 per cent confidence intervals.

higher ECEC spending from 56 to 69 per cent across the full distribution (from 52 to 77 per cent for women with children aged 1 to 4, see Fig. A.4). With country fixed-effects models (shown in Figure S4, see online supplementary data), statistical certainty increases and meets conventional levels of significance.

Comparing Figs 4 and 5, we have some information about what our analyses say about H1a relative to H1b. The moderating effect of ECEC on how ALMP promotes employment (Fig. 4) has slightly larger contrast in steepness of the slopes and higher statistical certainty compared to the moderating effect of ALMP on how ECEC promotes employment (Fig. 5). This suggests that complementarity may hold more for how ECEC moderates the employment-promotion of ALMP than vice versa—a point to which we return below.

4.1 Sensitivity and robustness

Our baseline analyses are robust to a wide range of supplemental analyses. First, results hold up to key alternative model specifications with respect to fixed effects, weighting, and lag structures relative to our multi-level model baseline. The results hold up to different embedding structures (e.g. country-year as level 2; years nested in countries as levels 2 and 3). The results are insensitive to one-year lags in the ALMP and ECEC measures, or excluding the lagged dependent variable. The baseline results also hold to use of sample weighting for the inverse of the sample size of each survey, assigning equal weights to individuals per survey to check for sensitivity to differences in the survey sample size. The direct ECEC effect increases in magnitude, but the ECEC-ALMP interaction effect remains comparable to the base model. Finally, the baseline results are insensitive to introducing dummies for

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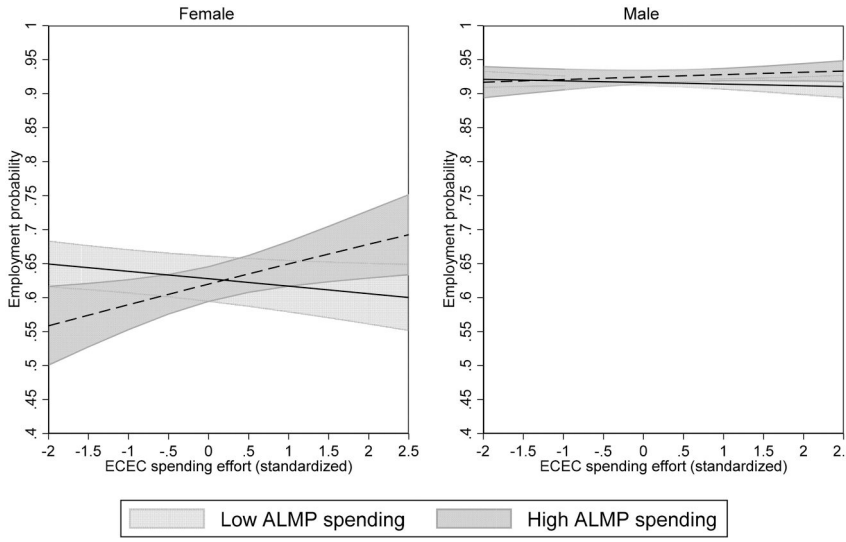

Figure 5. Predicted probability of employment across ECEC spending distribution, at low and high ALMP spending levels, for female and male workforce with children under age 5.

Source: Authors' calculations using Eurostat EU-SILC longitudinal data 2003–2019. Full models in Table 1.

Notes: Low/High ALMP spending at 10th and 90th percentile. Shades denote 95 per cent confidence intervals.

countries, or years, or both countries and years (i.e. two-way fixed effects). The key results of these tests are reported in Table A.3, with full estimates reported in Tables S3 and S4 (see online supplementary data).

Second, the baseline results hold to alternative specifications of "employment" and its alternatives, patterns summarized in Table A.4. A more inclusive employment status outcome *Employed, in Education or Training (EET)* reveals similar estimates to the base models (see model (2) in Table A.4, and details in Table S5 [see online supplementary data] and Figures S5 and S6 [see online supplementary data]). We also perform separate analyses assessing the probability of being employed compared to unemployed (excluding inactive from the sample), and the probability of being employed compared to inactive (excluding unemployed). Estimates show that the ALMP-ECEC interplay is particularly relevant for the employment promotion among the inactive (Table S6, see online supplementary data). And we find that the estimated effects of ALMP, ECEC, and their interaction are consistent with the baseline results when considering simple measures of employment quality, including permanent contractual status and reasonable working hours (51- and 41-hour thresholds; Table S7, see online supplementary data).

Third, our baseline estimates are robust to alternative and additional or fewer micro- and macro-level controls—the key results of which are summarized in Table A.5. The results hold when excluding controls, such as for poverty status or any other micro level characteristic. And they hold when excluding social spending or public spending on family benefits in cash at a macro level, or for that matter all macro-level controls. The baseline pattern also holds when considering other measures of social policy effort relevant to how ALMP and ECEC play out for employment chances particularly

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among mothers with small children. Importantly, the results hold to measures of paid maternity, parental, and home care leave duration available to mothers—either as a more focused alternative to the family benefit control in the baseline, or as an additional control, with or without country and time fixed effects (Table S8 [see online supplementary data] and Figures S7 and S8 [see online supplementary data]).

Fourth, we assess whether the baseline patterns hold across subsamples defined by micro-level respondent characteristics. Specifically, we conduct separate analyses for parents living with and without a partner. The estimates indicate that ALMP has positive effects on employment probabilities, particularly for lone mothers, and that ECEC further strengthens the ALMP effectiveness for this group (Table S9, see online supplementary data).

We also examine subsamples of parents of small children to explore the sensitivity of the baseline results, excluding mothers with children under ages 1 and 2, who may be on maternity or parental leave and therefore less likely to utilize ECEC or ALMP services. The complementarity between ECEC and ALMP persists for these subsamples, especially among mothers with children aged 1 to 4 (i.e. post-infancy and preschool age), both with and without controls for parental leave duration. Focusing on mothers with children aged 1 to 4 also yields a substantially larger direct effect of ECEC on maternal employment probabilities. The key results from these subsample analyses are summarized in Table A.6 and Figs A.3 and A.4.

Finally, we also checked for robustness across various country-based subsamples, reported in Table A.7 (full estimates in Table S10, see online supplementary data). For instance, the analyses were replicated excluding Eastern-European countries (Estonia, Latvia, Lithuania, and Poland); Central-European countries (Czech Republic, Hungary, Slovenia, and Slovakia); Southern-European countries (Greece, Italy, Portugal, and Spain); and Northern European countries (Denmark, Norway, and Sweden). The direction of the estimated interaction effect across these different country clusters remains positive and statistically significant. The ALMP-ECEC reinforcement effect varies across different country clusters, with slightly weaker interaction (but still substantive) when excluding Nordic countries. The identified variation suggests that the extent to which the two social investment policies reinforce each other's effectiveness reflects a country policy design and quality of ALMP and ECEC services, employment protection legislation, and other factors not studied here that vary over time and that directly affect parents' likelihood to engage in paid employment. Finally, we see broad replication of the baseline for analyses performed for country-years with different levels of public social spending, except for very high social-spending contexts where the interaction effect is smaller (Table S11, see online supplementary data). This suggests that social investment policy complementarities perform differently depending on contexts with more or less generous social policy "buffers."

5. Conclusion

This article has sought to clarify how two key faces of social investment policies—ALMP and ECEC provisions—interact in their implications for employment. Such clarification is important given the modest and discordant findings of existing studies of such interaction. In existing scholarship, findings supporting patterns of complementarity—where, e.g. ECEC enhances ALMP's employment-promotion—are balanced by findings supporting patterns of substitution where diminishing marginal returns entail ECEC and ALMP diminishing each other's marginal employment-promotion. Our study has sought to formulate empirically testable theoretical expectations where both of these dynamics can be at play. When focusing on micro-level individual employment chances, we expect

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ECEC and ALMP to positively moderate each other's promotion of individual-level employment, particularly of mothers with small children.

We find evidence for this view in micro-level panel data in Europe, where ALMP-ECEC policy complementarity is strongest for the employment chances of women with preschool children, the target population of ECEC services. The complementarity seems only slightly more relevant for how ECEC positively spurs the employment effects of ALMP than for how ALMP alters the employment effects of ECEC. For parents with care duties, using ALMP to find and keep a job is particularly facilitated by generous ECEC provisions even if some provisions are not directly aimed at increasing employability. While these patterns do not establish the potential micro-mechanisms of such ALMP and ECEC complementarity, they do reveal the extent and relevance of such complementarity—applying particularly for mothers of small children more than for other demographic groups.

However, we offer the study's findings mindful of our study's limitations. This study is limited in its exploration of employment as opposed to other labor-market and socioeconomic outcomes, and of possible macro- and micro-level conditions that may moderate or complicate how ALMP and ECEC interact in shaping employment. Also, despite our extensive efforts to control for time-invariant and time-variant macro factors that may confound the estimated ALMP-ECEC interaction effects, unobserved confounding factors remain, such as over-time shifts in tax incentives that can affect shifts in employment behavior (Rastrigina and Verashchagina 2015). Most fundamental, however, is that exposure to ALMP and ECEC provisions is measured at the aggregate, county level, shrouding individual-level variation in actual participation in ALMP and ECEC.

These important limits highlight the need for further research in several directions to clarify ALMP and ECEC interaction. Such research can explore how other fiscal or monetary policies or other country characteristics (e.g. industrial relations or industrial organization) might moderate the extent of ALMP-ECEC complementarity. And further research can explore other social policy interactions, such as whether social protection measures might diminish or sharpen ALMP and ECEC complementarity in shaping employment chances.

Future research should also consider how social policy interactions might affect different manifestations of labor market participation or economic experience generally. Our results revealed positive ALMP-ECEC interaction, particularly for individuals with younger children, on probability of employment. This finding, however, masks potential unobserved effects since our baseline outcome measure captured general employment status (employed versus unemployed or inactive). Such employed status encompasses all types of jobs, whereas parents (particularly women) are disproportionately overrepresented in precarious "outsider" jobs, such as part-time, temporary, low-income, and with low advancement prospects, and policies such as ECEC provision may influence these patterns (Seo 2023). As noted above, our sensitivity tests did consider how the baseline findings of ALMP-ECEC complementarity for mothers with preschool children apply not only to general employment but also to quality employment in permanent jobs with less burdensome over-hours. However, this only scratches the surface of an issue we leave for further research into how ALMP-ECEC policies jointly affect the *type of job* people obtain. For instance, ALMP-ECEC complementarity for mothers with preschool children is likely to shape other employment-related outcomes of these same women as their children get older, such as occupational stability, skill preservation, wage equality, and retirement income which are all highly relevant for individuals who no longer have small children and cannot directly benefit from ECEC services. Such possible links deserve further attention. Equally, the ALMP-ECEC interaction may affect important non-economic outcomes

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such as the mental health of mothers and the well-being of children, a dynamic worthy of further study as well.

Most fundamentally, future research needs to consider longer time series in true panel data, and—more importantly—measure program access and actual participation (in addition to the macro proxies on which we rely). Both of these kinds of data are lacking on a significant scale and yet are possible and have been discussed in European informational agencies consolidating EU-SILC and EU-Labor Force Survey. We strongly advise to pursue such deeper and longer data-gathering. But we also recommend smaller scale data to support designs beyond our second-best approach. Even with very modest coverage in time and space, future observational or (better) experimental research designs including direct measures of ALMP and ECEC participation will allow more direct estimates of how, including the mechanisms by which, policy interventions interact to shape employment.

In sum, our micro-level study of the interactions in the employment effects of ALMP and ECEC are but a part of fuller exploration of social policy interactions. That said, our study provides an important step forward in our knowledge of such interaction, suggesting that at the level of how social policies play out for *individuals*—in light of individual-level experience crucial to understanding social rights—complementarity in social investment appears to be present and substantively important.

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Supplementary data

Supplementary data are available at *Socio-Economic Review* online.

Conflict of interest statement. None declared.

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Data availability

The longitudinal micro data underlying this article were provided by Eurostat, EU Statistics on Income and Living Conditions (EU-SILC) by permission. No new data were generated or analyzed in support of this research. The macro data (social policy spending indicators) underlying this article are available in the article's Supplementary Material.

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Appendix

Table A.1. Country- and survey-year-coverage.

Country	Survey year	Country	Survey year
Austria	2004–2019	Latvia	2005–2019
Belgium	2004–2019	Lithuania	2005–2019
Czech Republic	2005–2019	Luxembourg	2004–2019
Denmark	2003–2019	Netherlands	2005–2019
Estonia	2004–2019	Norway	2003–2019
Finland	2004–2019	Poland	2005–2019
France	2004–2019	Portugal	2004–2019
Germany	2015–2019	Slovakia	2005–2019
Greece	2010–2019	Slovenia	2005–2019
Hungary	2005–2019	Spain	2004–2019
Ireland	2004–2019	Sweden	2004–2019
Iceland	2004–2017	Switzerland	2011–2019
Italy	2004–2019	United Kingdom	2005–2017

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Table A.2. Descriptive statistics of all indicators before standardization.

	Obs.	Mean	Std. dev.	Min	Max
Individual-level indicators					
Employed (ref. unemployed/inactive)	807,448	0.810	0.393		
Lag employed *(t-1)*	807,448	0.801	0.399		
Employed, in education or training (ref. unemployed/inactive/retired)	852,530	0.811	0.392		
Lag employed, in education or training (*t*−1)	852,530	0.805	0.396		
Employment quality: permanent contract and					
working less than 61 hours per week	809,182	0.784	0.412		
working less than 51 hours per week	807,448	0.748	0.434		
working less than 41 hours per week	807,448	0.610	0.488		
Gender (female/male)	807,448	0.540	0.499		
Age	807,448	39.67	7.778	20	55
Household size	807,448	4.068	1.168	1	10
Number of children under 12 months in household	807,448	0.072	0.283	0	6
Health (self-reported, scale good-bad)	807,448	1.949	0.735	1	5
Marital status: married	807,448	0.738	0.440		
Education: No or primary		0.068	0.253		
Lower secondary		0.143	0.350		
Upper secondary		0.440	0.493		
Higher (college/university)		0.349	0.477		
Poor (eq. disp. income < 60% national median)	807,448	0.148	0.355		
Macro-level indicators					
ALMP spending (% GDP/% unemployed)	381	0.095	0.077	0.004	0.391
ECEC spending (% GDP/% children)	381	0.131	0.060	0.007	0.287
Unemployment rate (20–64)	381	7.86	4.49	1.60	27.30
GDP growth (annual %)	381	2.07	3.57	−14.84	25.18
Old-age dependency ratio	381	25.73	4.46	15.16	36.06
Social spending, % GDP (excluding ALMP, ECEC, pensions)	381	13.48	3.38	5.74	19.41
Family benefits in cash, % GDP	381	1.41	0.57	0.42	3.36
Length of paid maternity and parental leave, weeks	356	69.17	52.95	14	214

Source: Authors' calculations using EU-SILC longitudinal data 2003–2019. Macro-level indicator sources specified in Section 3.1.

Notes: Individuals between ages 20 and 55 with children under age 18. Descriptive statistics for individuals with children under age 5 available in Table S2 (see online supplementary data).

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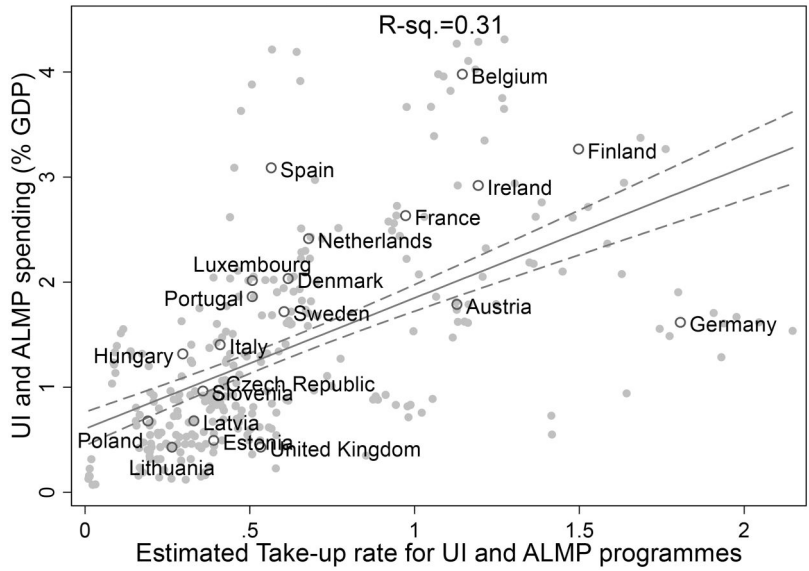

Figure A.1. UI/ALMP spending and estimated take-up of UI/ALMP programs.

Source: Author.

Notes: $R^2 = 0.31$. ALMP, active labor market policy; UI, unemployment insurance; GDP, gross domestic product; R-sq., R^2.

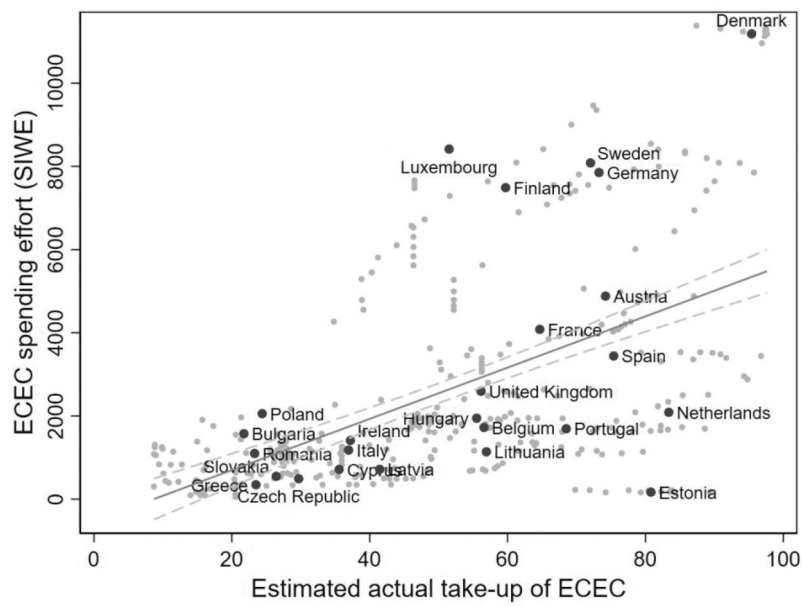

Figure A.2. ECEC spending and estimated ECEC take-up.

Source: The EUSOCIALCIT Comparative Social Citizenship Database.

Notes: Adj. $R^2 = 0.33$. ECEC, Early Childhood Education and Care; SIWE, Social Investment Welfare Expenditure data set.

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Table A.3. Odds ratios of being employed for women with children under age 5: different model specifications.

	(1) Base model: female, children <5	(2) 1-year lag for ECEC and ALMP measures	(3) Weight for inverse of sample size	(4) Country fixed effects	(5) Time fixed effects	(6) Country and time fixed effects	(7) Country and time fixed effects: logit model
ECEC spending, std.	1.064	1.015	1.241***	1.048	1.046	1.024	1.025
	(0.050)	(0.054)	(0.093)	(0.048)	(0.052)	(0.05)	(0.051)
ALMP spending, std.	0.974	1.014	0.942	0.958	0.966	.946	0.948
	(0.034)	(0.039)	(0.078)	(0.036)	(0.031)	(0.032)	(0.032)
ECEC × ALMP	1.145***	1.132**	1.135**	1.136***	1.121***	1.11**	1.107**
	(0.050)	(0.056)	(0.066)	(0.051)	(0.048)	(0.049)	(0.050)
Individual controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Macro controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	No	No	No	Yes	No	Yes	Yes
Time fixed effects	No	No	No	No	Yes	Yes	Yes
N observations	150,508	150,508	150,508	150,508	150,508	150,508	150,508
N individuals	70,251	70,251	70,251	70,251	70,251	70,251	
N countries	26	26	26	26	26	26	26
AIC	123728	123730	94	123564	123696	123696	123529
BIC	123927	123929	282	123753	123954	123954	123777

Source: Authors' calculations, EU-SILC longitudinal data 2003–2019.

Notes: Full models: model (4) in Table S3; models (2)–(3) and (5)–(7) in Table S4 (see online supplementary data).

$^{***}P < .01$, $^{**}P < .05$, $^{*}P < .1$.

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Table A.4. Odds ratios of being employed for women with children under age 5: dependent-variable sensitivity.

	(1) Base model: female, children <5	(2) Employed, in education or training (EET)	(3) Employed-unemployed (inactive excluded)	(4) Employed-inactive (unemployed excluded)	(5) Employment quality: permanent and <51 hours per week	(6) Employment quality: permanent and <41 hours per week
ECEC spending, std.	1.064	1.064	1.149*	1.010	1.254***	1.155***
	(0.050)	(0.050)	(0.085)	(0.065)	(0.050)	(0.033)
ALMP spending, std.	0.974	0.976	1.255**	0.947	0.957	1.000
	(0.034)	(0.036)	(0.118)	(0.042)	(0.040)	(0.033)
ECEC × ALMP	1.145***	1.150***	1.029	1.143**	1.126***	1.053*
	(0.050)	(0.047)	(0.077)	(0.065)	(0.036)	(0.029)
Individual controls	Yes	Yes	Yes	Yes	Yes	Yes
Macro controls	Yes	Yes	Yes	Yes	Yes	Yes
N observations	150,508	151,710	106,196	137,077	83,965	83,965
N individuals	70,251	70,840	55,287	66,240	51,507	51,507
N countries	26	26	26	26	26	26
AIC	123728	125975	52936	101408	69529	77618
BIC	123927	126174	53137	101615	69715	77805

Source: Authors' calculations, EU-SILC longitudinal data 2003–2019.

Notes: Full models in Table S5, model (2); Table S6, models (3)–(4); Table S7, models (5)–(6) (see online supplementary data).

$^{***}P < .01$, $^{**}P < .05$, $^{*}P < .1$.

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Table A.5. Odds ratios of being employed for women with children under age 5: different micro- and macro-level controls.

	(1) Base model: female, children <5	(2) Without control for poverty status	(3) Without control for social spending	(4) Without control for macro variables	(5) With control for length of maternity and parental leave
ECEC spending, std.	1.064	1.037	1.056	1.096**	1.073
	(0.050)	(0.049)	(0.050)	(0.043)	(0.051)
ALMP spending, std.	0.974	0.992	1.004	1.039	0.956
	(0.034)	(0.035)	(0.029)	(0.035)	(0.035)
ECEC × ALMP	1.145***	1.135***	1.137***	1.162***	1.164***
	(0.050)	(0.048)	(0.050)	(0.049)	(0.055)
Individual controls	Yes	Yes	Yes	Yes	Yes
Macro controls	Yes	Yes	Yes	No	Yes
N observations	150,508	150,508	150,508	150,508	143,961
N individuals	70,251	70,251	70,251	70,251	67,366
N countries	26	26	26	26	26
AIC	123728	124954	123751	123780	117933
BIC	123927	125142	123939	123929	118141

Source: Authors' calculations, EU-SILC longitudinal data 2003–2019.

Notes: Full models in Table S4, models (2)–(4); Table S8, model (5) (see online supplementary data).

$^{***}P < .01$, $^{**}P < .05$, $^{*}P < .1$.

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Table A.6. Odds ratios of being employed for women with children under age 5: micro-level subgroupings.

	(1) Base model: female, children <5	(2) Partner (couple)	(3) Without a partner (single)	(4) With children aged 2–4	(5) With children aged 1–4	(6) With children aged 1–4, with parental leave control
ECEC spending, std.	1.064	1.057	1.094	1.198***	1.263***	1.331***
	(0.050)	(0.058)	(0.066)	(0.071)	(0.106)	(0.121)
ALMP spending, std.	0.974	0.963	1.089*	0.952	0.962	0.926**
	(0.034)	(0.035)	(0.055)	(0.038)	(0.041)	(0.036)
ECEC × ALMP	1.145***	1.137***	1.074*	1.093	1.135**	1.159***
	(0.050)	(0.056)	(0.044)	(0.059)	(0.065)	(0.060)
Individual controls	Yes	Yes	Yes	Yes	Yes	Yes
Macro controls	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	No	No	No	No	No	No
N observations	150,508	131,702	18,806	89,408	122,836	117,426
N individuals	70,251	61,292	10,788	53,581	64,271	61,619
N countries	26	26	26	26	26	26
AIC	123728	107561	15992	63040	94698	90136
BIC	123927	107757	16149	63219	94883	90320

Source: Authors' calculations, EU-SILC longitudinal data 2003–2019.

Notes: Full models in Table S9, models (2)–(3); Table S7, models (4)–(5); Table S8, model (6) (see online supplementary data).

$^{***}P < .01$, $^{**}P < .05$, $^{*}P < .1$.

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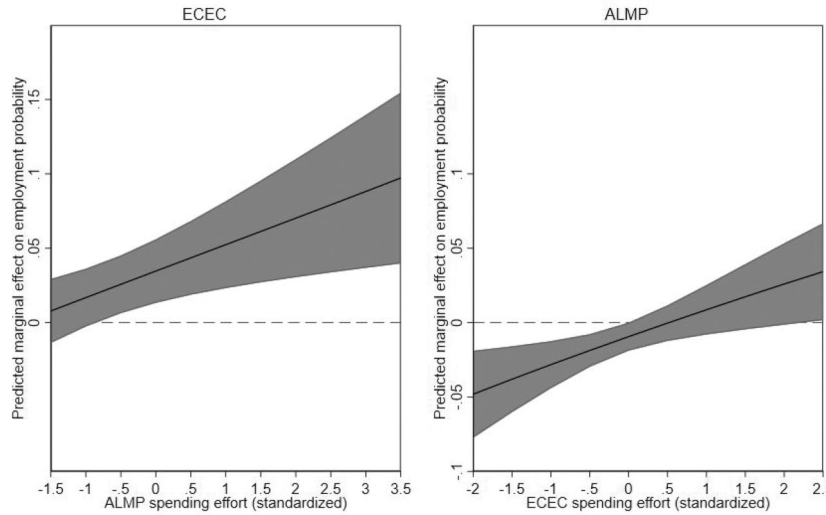

Figure A.3. Average marginal effect plots of ALMP–ECEC interaction on probability to be employed: ECEC effect conditional on ALMP efforts (left panel), and ALMP conditional on ECEC efforts (right panel). Women with children aged 1 to 4.

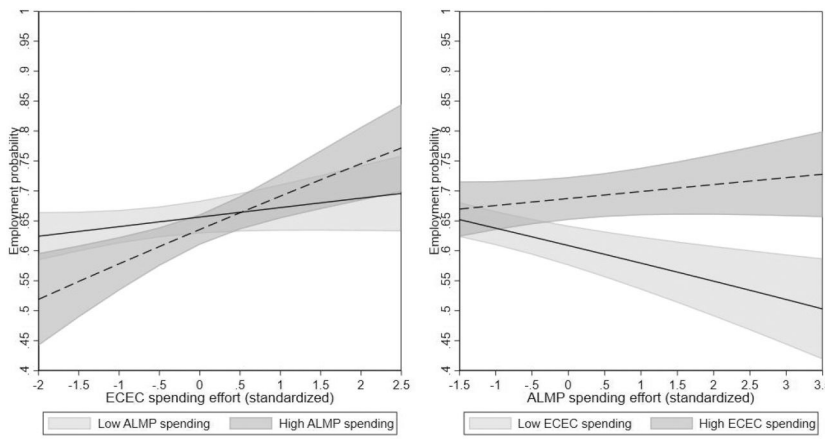

Figure A.4. Predicted probability to be employed across ALMP and ECEC spending distribution, at low and high ECEC and ALMP spending levels. Women with children aged 1 to 4.

Source: Authors' calculations using Eurostat EU-SILC longitudinal data 2003–2019.

Notes: Low/high ECEC and ALMP spending at 10th and 90th percentile. Shades denote 95 per cent confidence intervals. Model includes control for length of paid maternity and parental leave. Full model in Table S8 (see online supplementary data), model (5).

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Table A.7. Odds ratios of being employed for women with children under age 5: macro-level subgroupings.

	(1) Base model: female, children <5	(2) Without Iceland	(3) Without Switzerland	(4) Without Eastern European countries (EE, LT, LV, PL)	(5) Without Central European countries (CZ, HU, SK, SI)	(6) Without Southern European countries (ES, GR, IT, PT)	(7) Without Northern European countries (DK, NO, SE)
ECEC spending, std.	1.064	1.065	1.058	1.099	1.054	1.055	1.011
	(0.050)	(0.051)	(0.049)	(0.065)	(0.059)	(0.050)	(0.032)
ALMP spending, std.	0.974	0.976	0.975	0.945*	0.979	0.993	0.975
	(0.034)	(0.035)	(0.034)	(0.032)	(0.044)	(0.037)	(0.032)
ECEC × ALMP	1.145***	1.138***	1.140***	1.151**	1.136**	1.151***	1.081**
	(0.050)	(0.050)	(0.050)	(0.064)	(0.060)	(0.050)	(0.039)
Individual controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Macro controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Variance countries	0.307***	0.298***	0.318***	0.312***	0.244***	0.339**	0.255***
	(0.099)	(0.098)	(0.101)	(0.104)	(0.083)	(0.138)	(0.084)
Variance individuals	0.000	0.000	0.000	0.000	0.000	0.074	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.120)	(0.000)
N observations	150,508	149,063	148,173	123,118	128,155	110,825	143,547
N individuals	70,251	69,517	69,129	56,891	59,688	50,466	66,939
N countries	26	25	25	22	22	22	23
AIC	123728	122259	121306	97663	101628	94384	120568
BIC	123927	122457	121505	97858	101823	94586	120766

Source: Authors' calculations, EU-SILC longitudinal data 2003–2019.
Notes: Full models in Table S10 (see online supplementary data).
$^{***}P < .01$, $^{**}P < .05$, $^{*}P < .1$.

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