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ORIGINAL PAPER

Transmission channels of the cohesion policy: direct and indirect effects on EA synchronicity

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Abstract

This study focuses on the examination of the side effects of the European cohesion policy (ECP), in particular, the direct and indirect effects of the European structural and investment (ESI) funds on business cycle co-movement in the Euro area (EA) countries. The results of analysis performed using the simultaneous equations framework in the 2000–2019 period reveal that increasing ESI payments within the cohesion policy have overall contributed to more synchronized EA business cycles. Even though the ESI payments do not seem to directly support synchronization, probably because of their procyclical nature, we find that the unintended benefits of the ESI payments with respect to the synchronization lie in their indirect positive effects, which outweigh the negative direct effect. The total positive effect of the ECP emerges because increasing investment from the ESI funds promotes the EA business cycle synchronization via trade, bilateral FDI, and income similarity. Meanwhile, similar evidence has not been confirmed for the specialization channel.

Keywords European structural and investment funds · Synchronization · Business cycles · Euro area · Simultaneous equations model

JEL Classification E32 · E62 · F15 · F36

1 Introduction

The European structural and investment (ESI) funds under the European cohesion policy (ECP) are designed to promote economic growth and reduce economic disparities between member states (see e.g., Hagen and Mohl 2009; Pellegrini et al.

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2013; Staehr and Urke 2022). While a plethora of studies has been published regarding this objective, a new strand of literature examining the unintended side effects of ECP is slowly expanding and gaining attention in academic circles. Recent focus has been placed, for instance, on the examination of the pervasiveness of cooperative behavior at the local level regarding the ECP (see Accetturo et al. 2014). In addition, studies have examined the effects of ESI payments on the trust in politicians (see Tomankova 2022), but also, there have been arguments that the ECP can bring the member states closer to the optimum currency area (Ahner 2018; Dicharry and Stiblarova 2023).

In this regard, the optimum currency areas (OCA) theory pioneered by Mundell (1961), which is considered a workhorse for the empirical analyses of monetary integration in Europe (Darvas and Szapary 2008; Gachter and Riedl 2014), provides the rationale behind the potential ECP role in creating OCA. The OCA assumes that countries showing remarkable differences in the evolution of their business cycles might be exposed to mutual imbalances (Aguiar-Conraria and Soares 2011; Babetskii 2005; Campos and Macchiarelli 2016) and the nonoptimal common monetary policy.[1] Business cycle synchronization, which is mainly examined in the euro area (EA) (see, e.g., Campos and Macchiarelli 2016; Crespo-Cuaresma and Fernandez-Amador 2013; Pentecote et al. 2015) is therefore critical for creating OCA. The scarce empirical evidence suggests that OCA is promoted via ESI payments as well (Dicharry and Stiblarova 2023).

However, despite vast empirical evidence in both research areas individually, existing studies have not yet investigated the direct and indirect effects of the ECP on the EA business cycle synchronization. Such disaggregated look, covering the simultaneous relations among the driving forces of the synchronicity, may reveal different channels and effects of ECP. For instance, the direct effect of the ESI payments may be positive or negative, depending on the cyclical character of the ECP. A positive direct effect may be observed when the resources from the ECP are allocated in a countercyclical manner, so the member states can handle the asymmetric shocks (i.e., crises) and become more synchronized. On the other hand, the reason behind the negative direct effect may lie in the absorption paradox that appears when the recipient countries are unable to absorb the ESI payments during recessions (OECD 2019) or the procyclical fiscal policy of which the ECP is a part (McManus and Ozkan 2015). At the same time, the ESI payments may have indirect effects through the traditional driving forces of the synchronization, such as foreign trade, FDI, and specialization, but also through supporting income convergence. While these channels of the ECP on synchronization have not been properly examined, the overall positive effect initially observed in the seminal study may lie in one of those unrevealed effects.

The aim of the paper is therefore to examine effects of both direct and indirect effects of ESI payments on business cycle synchronization in the EA, which to the best of our knowledge has not yet been investigated. The results suggest that, overall, ECP helped to more synchronized EA business cycles. Although it directly

[1] The strand of the literature, to which this paper also contributes, deals with business cycles defined as deviations of economic activity from its long-term trend.

contributes to less synchronized EA business cycles, the total positive effect emerges due to stronger positive indirect effects of the ECP. In particular, higher ESI payments support the synchronicity in the EA via increased trade intensity, FDI, and income similarity, while a robust channel of specialization has not been confirmed.

The remainder of the paper is described as follows. The second section provides a related literature review focused on the ECP, with an emphasis placed on its side effects regarding business cycle synchronization. The third section describes the methodology used to account for possible simultaneous relationships among the considered variables. Specifically, we implement a simultaneous equations framework for EA sample in the 2000–2019 period. In the fourth section, we provide empirical results and a discussion. We conclude our findings regarding ESI payments in light of the common EMU policy in the closing section.

2 Literature review

Over the decades, there have been debates about the effectiveness of ECP regarding its main objective of alleviating imbalances between countries and regions in the European Union (see, e.g., Ahner 2018; Becker et al. 2012; Boldrin et al. 2001; Crescenzi et al. 2020; Ederveen et al. 2006). While this remains an open empirical issue (Di Caro and Fratesi 2022), recent studies point to the evidence of unexpected outcomes of ESI payments, which have gradually attracted attention in empirical research.

In this respect, the authors provide a broader perspective on the ECP outcomes with a connection to the well-being or quality of life (Albanese et al. 2021), social capital (Accetturo et al. 2014), functioning of the monetary union (Ahner 2018; Dicharry and Stiblarova 2023), or trust in politicians (Tomankova 2022). For instance, Albanese et al. (2021) investigate the causal effect of the ECP on regional well-being. Using a fuzzy regression discontinuity design, the results do not indicate that the ECP would reduce the gap in regional well-being during the programming period 2007–13.

Tomankova (2022) states for the same programming period that the ECP has no impact on the share of citizens who trust politicians but increases the share of those who express distrust. The author suggests that such behavior is initiated by Greek regions characterized by economic downturns. Accetturo et al. (2014) warn about the negative effect of the ESI payments on social capital in recipient regions during 2000–2006. In particular, they find that the ESI payments under Objective 1 decrease local endowments of trust and cooperation, which might be related to the poor effectiveness of local public goods.

On the contrary, Ahner (2018) states that the support from the ECP while fulfilling the mission of reducing economic differences in the member states' development, has facilitated the functioning of the European Monetary Union (EMU). The author also straightforwardly declares that the ECP helped the EU move toward the optimum currency area, which suggests the supporting role of the ECP concerning the fulfillment of the OCA criteria. Additionally, recent evidence suggests that the ECP seems to have a positive externality on the EMU's common monetary policy

in the form of increased business cycle synchronization of the recipient countries (Dicharry and Stiblarova 2023).

However, the existing empirical evidence is limited and there have not been inspected direct and indirect channels separately in this respect so far. This matter is crucial especially because the drivers of the synchronization tend to simultaneously affect the synchronization, which can result in complex relationships between considered variables.[2]

While examining the co-movement of the business cycles, trade intensity has been the most examined synchronization driving force so far (see, e.g., Abbott et al. 2008; Baxter and Kouparitsas 2005; Clark and Van Wincoop 2001; Frankel and Rose 1998; Gruben et al. 2002; Imbs 2004). The research on the trade–co-movement puzzle originates from a study by Frankel and Rose (1998) who identify a strongly positive and statistically significant effect of trade intensity on business cycle co-movements due to boosted demand shocks among 20 industrialized countries during the period 1959–1993. These results are consistent with later studies, including Baxter and Kouparitsas (2005) and Calderon et al. (2007), who also confirm a positive relationship between trade intensity and synchronization.

In this vein, the ECP assisted the EU regions in adapting to the liberalization of the EU trade policy. Because of that, supported private consumption is expected to increase trade linkages (see, Ahner 2018; Bradley et al. 2007). Ahner (2018) also states that investment to transport and communication infrastructure financed through the ECP helps to ease the trade flows of goods and services, indicating a potential indirect channel of synchronization.

However, special attention should be paid to the potential simultaneity of trade integration and specialization; increased trade may also invite a higher degree of specialization, which can result in less synchronized business cycles. Negative effects of specialization on business cycle co-movement have been confirmed, for instance, by Calderon et al. (2007) and Imbs (2004), who find that countries with similar production patterns are more correlated as they react to aggregate shocks in a similar way. This indirect effect is also emphasized by Krugman (1993) who argues that further integration involves the concentration of industry, and the appearance of sector-specific idiosyncratic shock hereby may lead to more divergent business cycles in the future.

Since the ECP aims to alleviate differences in economic development among the member states, there might exist a negative indirect effect of the ECP payments on the specialization of the EA countries. The character of trade linkages also plays a significant role: whereas inter-industry trade should lead to less symmetric business cycles, intra-industry trade alongside lower specialization should result in the opposite. Bower and Guillemineau (2006) conclude that intra-industry trade has developed mostly after the introduction of the euro in Europe. Such evidence follows the results of Frankel and Rose (1998), where intra-industry trade linkages prevailed in a sample of industrialized

[2] This topic is extensive due to the simultaneous character of considered business cycle determinants. Therefore, we recommend surveys of empirical studies for more detailed information, such as in De Haan et al. (2008) or Campos et al. (2019).

countries. Other empirical studies of industrialized countries confirm these findings (see, e.g., Clark and Van Wincoop 2001; Fatas 1997).

In addition to trade intensity and specialization, multiple studies have investigated the impact of financial integration on business cycle co-movement. Here, we should first refer to the seminal work of Imbs (2004) who examines, *inter alia*, the effects of financial integration on business cycle synchronization. Despite a broader context, Imbs (2004) considers the net foreign assets position of the country, including FDI, as one of the indicators of financial integration. Based on the results, FDI supports synchronization through a contagion effect as well as the opposite indirect effect imposed by specialization. In that ECP payments have been found to be one of the factors promoting FDI (see, e.g., Bevan and Estrin 2004), they can indirectly result in more synchronized business cycles (as in, e.g., Hsu et al. 2011) or decoupled business cycles (see, e.g., Antonakakis and Tondl 2014).

Alongside trade, specialization, and FDI, empirical research has focused on other, nontraditional driving forces of synchronization, such as fiscal policy or income convergence. Fiscal policy has been a subject of research by Darvas et al. (2005), who find evidence that countries converging by their budget positions show a higher level of business cycle synchronization. Moreover, a reduction in fiscal deficit is associated with a rise in synchronization. Additionally, Antonakakis and Tondl (2014) find out that income convergence (i.e., a decrease in countries' disparities in GDP per capita) promotes business cycle synchronization as well.

Payments from the ESI funds somehow fall under both areas—the ESI payments present the supranational transfers, which can be considered as a tool of fiscal policy, while they should serve to achieve the principal goal of the ECP—income convergence. In this respect, the European Commission (2022a) claims that the ambition of the Cohesion Policy to alleviate discrepancies among the member states is gradually being realized, which may create another indirect effect on synchronization.

Compared to the vast number of studies examining traditional drivers of the synchronization and the primary research on the ECP effects on convergence and economic growth (e.g., Becker et al. 2012; Crescenzi and Giua 2017; Hagen and Mohl 2009; Pellegrini et al. 2013), there exists a gap in the empirical literature regarding its effects on synchronization we would like to fill by this paper. We contribute to the existing empirical literature in two ways. Firstly, we provide disaggregated evidence of the direct and indirect effects of ESI payments on business cycle synchronization, which has been so far overlooked in empirical research. Our findings can reveal different effects of the ESI payments on synchronization that can be caused by the simultaneous nature of the variables' relationships. At the same time, we enlarge a list of potential synchronization driving forces, which might contribute to higher effectiveness of the common monetary policy in the EA. Moreover, we expand the empirical literature on ESI funds.

3 Model specification and data

To examine the relationship between ESI funds and EA synchronicity, we apply a simultaneous equations framework. Our system of simultaneous equations relies on the initial model specification presented by Imbs (2004) and later adapted in the

empirical studies focused on the traditional driving forces of the business cycle co-movement.

Unlike the existing research, the presented model is more complex as it is extended by a separate equation for the ESI funds, which allows us to explore their individual effects. At the same time, the model permits us to control the endogeneity issue related to the considered macroeconomic variables. The system of equations is defined as follows:

$$\begin{aligned} BCS_{ijt} = {} & \alpha_1 Trade_{ijt} + \alpha_2 FDI_{ijt} + \alpha_3 Spec_{ijt} + \alpha_4 GovDef_{ijt} \\ & + \alpha_5 IncomeSim_{ijt} + \alpha_6 ESI_{ijt} + I_{1ijt} + \mu_{1ij} + \lambda_{1t} + \varepsilon_{1ijt} \end{aligned} \tag{1}$$

$$Trade_{ijt} = \beta_1 BCS_{ijt} + \beta_2 FDI_{ijt} + \beta_3 Spec_{ijt} + \beta_4 ESI_{ijt} + I_{2ijt} + \mu_{2ij} + \lambda_{2t} + \varepsilon_{2ijt} \tag{2}$$

$$\begin{aligned} FDI_{ijt} = {} & \gamma_1 BCS_{ijt} + \gamma_2 Trade_{ijt} + \gamma_3 Spec_{ijt} + \gamma_4 IncomeSim_{ijt} + \gamma_5 ESI_{ijt} + I_{3ijt} \\ & + \mu_{3ij} + \lambda_{3t} + \varepsilon_{3ijt} \end{aligned} \tag{3}$$

$$\begin{aligned} Spec_{ijt} = {} & \delta_1 BCS_{ijt} + \delta_2 Trade_{ijt} + \delta_3 FDI_{ijt} + \delta_4 IncomeSim_{ijt} + \delta_5 ESI_{ijt} + I_{4ijt} \\ & + \mu_{4ij} + \lambda_{4t} + \varepsilon_{4ijt} \end{aligned} \tag{4}$$

$$GovDef_{ijt} = \zeta_1 BCS_{ijt} + \zeta_2 IncomeSim_{ijt} + I_{5ijt} + \mu_{5ij} + \lambda_{5t} + \varepsilon_{5ijt} \tag{5}$$

$$\begin{aligned} IncomeSim_{ijt} = {} & \eta_1 BCS_{ijt} + \eta_2 FDI_{ijt} + \eta_3 GovDef_{ijt} + \eta_4 ESI_{ijt} + I_{6ijt} + \mu_{6ij} \\ & + \lambda_{6t} + \varepsilon_{6ijt} \end{aligned} \tag{6}$$

$$\begin{aligned} ESI_{ijt} = {} & \theta_1 Trade_{ijt} + \theta_2 FDI_{ijt} + \theta_3 GovDef_{ijt} + \theta_4 IncomeSim_{ijt} + I_{7ijt} + \mu_{7ij} \\ & + \lambda_{7t} + \varepsilon_{7ijt} \end{aligned} \tag{7}$$

where *ij* denotes country-pair and *t* stands for the time period. The term μ_{mij} presents the country-pair fixed effects, λ_{mij} presents the time-specific fixed effects, and ε_{mij} stands for the error term in *m*-th equation ($m = 1, 2, \ldots, 7$). Moreover, each equation consists of a different set of exogenous explanatory variables (I_{mijt}) that are employed to achieve the system identification and reduce any potential omitted variables bias.[3] The model is estimated on bilateral county-pairs observations involving the euro area member countries since the OCA theory considers the examination of the business cycle synchronization as relevant in the context of the monetary unions.

Our model consists of seven simultaneous equations. The principal equation (Eq. 1) explains the business cycle synchronization (*BCS*) between country *i* and *j* in time *t* by six endogenous synchronization driving forces: trade intensity (*Trade*),

[3] For the identification of the system, the number of exogenous variables excluded in each equation must be equal to or greater than the number of endogenous variables included in the same equation. Thus, each equation requires a different set of exogenous variables (Wooldridge 2006).

FDI (*FDI*), specialization (*Spec*), government deficit (*GovDef*), income similarity (*IncomeSim*), and payments from the European Structural and Investment funds (*ESI*). While increased trade intensity, FDI, converging budget positions, and income similarities have been proven to promote business cycle synchronization, a higher level of specialization should result in less synchronized business cycles. The empirical literature lacks any evidence of the direct or indirect effect of ESI payments on synchronization, which may differ because of the simultaneous relations of considered variables. For this reason, this paper extends further and disentangles the issue by considering the ESI variable not only as a direct determinant of synchronization (Eq. 1) but also as a determinant of the remaining endogenous variables (see Eqs. 2–6).

When identifying our main variable, *BCS*, we follow recent studies defining the synchronization measure as a negative divergence in business cycles, that is, a negative absolute value of the differences in the country pairs' real GDP growth rates (see, e.g., Kalemli-Ozcan et al. 2013; Louis and Simons 2014):

$$BCS_{ijt} = -\left|\ln y_{it} - \ln y_{jt}\right| \tag{8}$$

Similar to the Pearson correlation coefficient, a higher value of *BCS* implies a higher level of synchronization. However, the benefit of this alternative measure is that it is not time-invariant as simple correlations, nor subject to the end-point bias problem occurring in the case of the well-known Hodrick–Prescott (HP) filter traditionally used in business cycle research. As a part of our robustness check, we estimate the system of equations where the alternative synchronization measure (*BCS_alter*):

$$BCS\_alter_{ijt} = cor\left(OG_{it}, OG_{jt}\right) \tag{9}$$

presents correlations of the output gaps estimated using the Christiano–Fitzgerald (CF) filter, which also does not suffer from end-point bias.

In Eq. 1, we also consider two exogenous (control) variables (I_1): education (*Edu*), which is defined as an absolute difference between the level of percentage of the population with the considered educational attainment, and economic development (*Dev*), measured as the sum of the real GDP per capita levels in countries *i* and *j*. Education presents a proxy for human capital, for which differences should result in less synchronized business cycles (Ductor and Leiva-Leon 2016). We also expect that countries with higher incomes tend to synchronize more (see, e.g., Louis and Simons 2014).

Equation 2 explains trade intensity by the business cycle synchronization (*BCS*), FDI variable (*FDI*), specialization (*Spec*), ESI payments (*ESI*), and a set of exogenous regressors (I_2). We assume that more synchronized countries tend to trade more with each other. The effect of the FDI variable on trade intensity might be positive or negative depending on the nature of the FDI. A higher level of industrial specialization should generate more intense trade linkages (e.g., Balassa 1986). Additionally, ESI payments should improve infrastructure and, in turn, raise competitiveness of the recipient countries, which might be reflected in increased trade

intensity. This effect might reveal the potential indirect ECP effect on synchronization through trade.

We follow previous studies (e.g., Baxter and Kouparitsas 2005; Fries and Kappler 2015) and define trade intensity (*Trade*) as a sum of exports and imports of country *i* to country *j* divided by the sums of country's *i* and *j* nominal GDP[4]:

$$Trade_{ijt} = \frac{EX_{ijt} + IM_{ijt}}{GDP_{it} + GDP_{jt}} \tag{10}$$

In addition to endogenous variables, two exogenous regressors are included—economic development (*Dev*) and institutional variable rule of law (*Rule*) measured as the absolute differences of the rule of law index between countries *i* and *j*. We expect that trade relations expand between partners of similar institutional quality and higher income levels, which would confirm previous findings of more synchronized "*core*" (i.e., more developed) EU member states (see, Darvas and Szapary 2008; Aguiar-Conraria and Soares 2011).

In Eq. (3), FDI is explained by the business cycle synchronization (*BCS*), trade intensity (*Trade*), specialization (*Spec*), income similarity (*IncomeSim*), the ESI payments (*ESI*), and several exogenous variables (I_3). Such specification should permit us to examine whether FDI investors seek less or more synchronized destinations, but also whether FDI is mostly of horizontal or vertical type (negative/positive coefficient related to *Trade*). FDI decisions may be in a negative relation to industrial specialization since FDI should appear in countries with similar economic structures (see, e.g., Hsu et al. 2011). We also expect that income similarities and the ESI payments could attract investment (e.g., Staehr and Urke 2022) and, therefore, indirectly promote synchronization through FDI.

The dependent variable *FDI* is defined as a sum of outward FDI from country *i* to *j* and outward FDI from country *j* to *i* divided by the sums of their total FDI, as in Hsu et al. (2011).[5] For identification of the system, we add a control of the corruption index (*Corrupt*), which is a proxy for the institutional environment and education (*Edu*), both measured as absolute differences between countries *i* and *j*. This technique allows us to inspect whether differences in institutional quality (Jovanovic and Jovanovic 2018) and human capital (Katsaitis and Doulos 2009) attract or discourage FDI investors.

In Eq. (4), specialization is explained by five endogenous variables, namely synchronization (*BCS*), trade intensity (*Trade*), FDI (*FDI*), income similarity (*IncomeSim*), and ESI payments (*ESI*), whose indirect negative effects on synchronization may be observed by this equation. The inclusion of the BCS variable permits us to investigate the possible reverse causality between specialization and business cycle synchronization. In line with classical Ricardian theory (Dornbusch et al.

[4] Following Frankel and Rose (1998), we also estimate the system of equations using an alternative measure of trade intensity defined as bilateral trade divided by the sums of total trade in countries *i* and *j* (imports and exports). The robustness check appears in the Online Appendix.

[5] For the robustness check, we also consider an alternative measure of bilateral FDI: a sum of outward FDI from country *i* to *j* and outward FDI from country *j* to *i* divided by the sums of their nominal GDP (see Online Appendix).

1977), we expect that trade intensity may foster specialization. The same can hold for increased FDI, while the country pairs with less similar income should be more specialized. As the ECP aims to alleviate economic disparities (see, e.g., Crescenzi et al. 2020), we assume a negative effect of the ESI variable on specialization.

To measure specialization, we compute Krugman's (1993) industrial specialization index:

$$Spec_{ijt} = \sum_{z=1}^{Z} \left| s_{zit} - s_{zjt} \right| \tag{11}$$

Here, we follow Antonakakis and Tondl (2014) and Stiblarova (2023) by considering the value added of 23 branches (Z) from the total manufacturing sector, where s_{zit} presents a share of sector z in country i, and s_{zjt} presents a share of the same sector in country j.[6] This index ranges from 0 to 2, where a value of 0 indicates perfect similarity (identical industrial structure), and a value of 2 indicates perfect specialization (completely distinct sectors). We also include two exogenous variables—regulatory quality index (*Regul*) and inflation (*Inf*), both measured as absolute differences between countries i and j. Here, differences in regulatory quality and inflation may positively mimic differences in industrial structure.

Equation 5 describes the government deficit (*GovDef*) by the business cycle synchronization (*BCS*), income similarity (*IncomeSim*), and several exogenous variables. Such specifications should allow us to investigate whether similar business cycles and income are related to converging fiscal positions. Concerning the EU's fiscal discipline, we define the government deficit variable as in Lukmanova and Tondl (2017), namely an absolute difference in the budgetary positions of countries i and j, excluding interest payable (i.e., primary deficit or surplus). This analysis should reveal the fiscal divergence among the considered country pairs.[7]

In this equation, four exogenous variables are included: level of unemployment (*Unemp*), the government effectiveness (*Effect*) index, inflation (*Inf*), and debt (*Debt*), all measured as absolute differences. We assume that fiscal convergence will be associated with more similar unemployment levels, government effectiveness, inflation, and debt levels (Lama and Medina 2019).

Income similarities (*IncomeSim*) are explained in Eq. 6 by four endogenous variables, including business cycle synchronization (*BCS*), FDI (*FDI*), government deficit (*GovDef*), and ESI payments (*ESI*). We define *IncomeSim* as the absolute differences in real GDP per capita between the country-pairs and inspect whether more synchronized business cycles, stronger FDI, and fiscal convergence help to decrease income disparities in the EA. We expect that increased ESI payments should decrease gaps between countries' incomes, validating their primary goal of income convergence, and possibly having an indirect effect on synchronization. The control of corruption index (*Corrupt*) and economic development (*Dev*) are added to this equation as

[6] Data are retrieved from the United Nations Industrial Development Organization's (UNIDO) database.

[7] By considering primary deficit/surplus, we focus on the government spending without the burden of past debt. Additionally, we estimate the system of simultaneous equations using alternative measure of government deficit/surplus (including interest payable) as in Darvas et al. (2005) (see Online Appendix).

well. Here, institutional convergence and economic development may be linked to alleviating income disparities (e.g., Blackburn et al. 2006).

Finally, Eq. 7 describes ESI payments (*ESI*) by four endogenous variables: trade intensity (*Trade*), FDI (*FDI*), government deficit (*GovDef*), and income similarity (*IncomeSim*). This specification allows us to investigate whether converging fiscal or income positions or more trade and FDI linkages are associated with increased ESI payments.

The ESI variable is defined as a sum of annual expenditure from the ECP to countries *i* and *j* (as a share of GDP). Following Dicharry and Stiblarova (2023), we consider the payments from the European Regional Development Funds (ERDF), Cohesion Fund (CF), and European Social Fund (ESF), which provide most of the financial resources from the ECP.[8] Moreover, those payments remain consistently reported and comparable through multiple programming periods.[9] To achieve system identification, two control variables are added to Eq. 7: the control of corruption (*Corrupt*) and agriculture output (*Agri*). We expect countries with similar agriculture output and institutional quality to experience corresponding ESI payments. Moreover, the emphasis on sound financial management in the EU budgeting system (see, e.g., European Commission 2022b) should prevent the ESI allocation in which fraud actions occur (i.e., a higher level of corruption, which can diverge the ESI allocation from productive activities).[10]

The error terms in the system of equations are likely to be contemporaneously correlated. Ignoring this and estimating equations separately would lead to inefficient estimates of the coefficients (Henningsen and Hamann 2007). Therefore, we employ a seemingly unrelated regression (SUR) estimator proposed by Zellner (1962), which should provide efficient estimates. In the SUR, all equations are estimated simultaneously using a feasible least squares estimation.

The sample covers an annual panel data set of the EA countries in the 2000–2019 period.[11] The variables used in the estimation of the model undergo several transformations. First, the majority of variables are calculated as % of GDP to account for

[8] As a part of the robustness check, we also provide estimation results for the examined funds separately (see Online Appendix).

[9] Although the European Agricultural Fund for Rural Development (EAFRD) and the European Maritime and Fisheries Fund (EMFF) have been considered to be a part of the Cohesion policy in 2014–2020, only ERDF, CF, and ESF are used to fulfill the objectives of the European Cohesion Policy in the programming period 2007–2013 (see Council Regulation (EC) No 1083/2006 and repealing Regulation (EC) No 1260/1999). Not considering the given funds is also supported by the fact that in the current programming period, funds for agricultural and fisheries sectors are not considered to be the Cohesion Policy funds as well.

[10] The conditionality of the ECP's effectiveness on institutional quality has been the subject of several studies (see, e.g., Ederveen et al. 2006; Huliaras and Petropoulos 2016).

[11] For consistency across different programming periods, we rely on a single database of historical ESI payments provided by the European Commission where newer observations are not available. By doing this, we also prevent the distortion of the results stemming from the COVID-19 pandemic in 2020 which caused breaks in most considered time series. In the following years, the ESI payments have been also re-oriented and used for post-pandemic recovery purposes in line with the Coronavirus Response Investment Initiative (CRII) and the Coronavirus Response Investment Initiative Plus (CRII+) which could bias the results as well.

Table 1 Descriptive statistics. *Source*: Own calculations based on data from the European Central Bank, European Commission, Eurostat, IMF, UNCTAD, UNIDO, and the World Bank

Variable	Obs	Min	Mean	Median	S.D	Max
BCS	3356	−0.9931	−0.2532	−0.1973	0.1770	−0.0188
BCS_alter	3356	−1.3889	0.3355	0.3451	0.4187	1.8828
Trade	3356	0.0019	0.5771	0.1972	0.9981	9.4439
Trade_alter	3356	0.0010	0.6696	0.2089	1.0939	6.4384
FDI	2843	−0.1737	0.8340	0.1900	1.6035	17.5030
FDI_alter	3356	−0.6733	1.1456	0.1696	3.9806	101.5681
Spec	3356	0.1358	0.6485	0.6105	0.2312	1.5335
GovDef	2843	0.1712	2.8322	2.4438	1.8522	13.5138
GovDef_alter	3356	0.1200	3.2872	2.7200	2.2151	15.6200
IncomeSim	2843	5.0730	9.5240	9.7020	0.9973	11.3700
ESI	3356	0.0277	1.4746	1.4356	1.1936	5.6910
ESI_ERDF	3356	0.0132	0.7648	0.7242	0.6173	2.9085
ESI_CF	3356	0.0000	0.4333	0.3284	0.4153	2.1140
ESI_ESF	3356	0.0119	0.2765	0.2388	0.2045	1.1571
Edu	3356	0.2000	14.0590	10.3600	12.0910	57.4400
Dev	2843	9.8510	10.8860	10.8700	0.4056	11.9210
Rule	3356	0.0141	1.3837	1.2611	0.9489	4.2104
Corrupt	3356	0.0424	1.8600	1.6761	1.1942	4.9614
Regul	3356	0.0310	0.9847	0.8753	0.6665	3.5452
Inf	2843	0.1600	1.2130	0.9200	0.9738	7.4800
Unemp	3356	0.1600	4.4713	3.2500	3.9042	20.5400
Effect	3356	0.0494	1.3360	1.1680	0.9049	4.9740
Debt	3356	0.6200	41.2219	35.0400	29.5340	171.1200
Agri	2843	0.0239	2.4725	1.8847	2.1171	11.5260

the country's size or absolute differences in order to simplify the country pairs interpretations. Consequently, we perform a 5-year rolling window transformation by which we lose few observations but remove excessive fluctuations and noise in the time series.[12] Descriptive statistics for considered variables are available in Table 1, while the complete description of variables is available in Table A1 in the Online Appendix.

[12] The decision about the length of the rolling window (5 years) has been made based on previous synchronization studies using the simultaneous equations framework (see, e.g., Lukmanova and Tondl 2017).

4 Empirical results and discussion

The estimation results using the simultaneous equations framework of our baseline model are provided in Table 2. In all cases, the system of equations has been estimated using the SUR estimator which was selected because of contemporaneously correlated error terms in the system of equations.[13]

We provide the estimation results for different variants of our sample. Column (I) indicates the estimation considering the full sample. As our data sample includes the Great Recession in 2008–2009, which could possibly bias the overall results, we also estimate the system of equations for the sample excluding the crisis of 2008–2009, which is available in column (II).[14] Additionally, we exclude the major net payers and major net recipients of the EU budget from the sample.[15] Such estimation results are provided in columns (III) and (IV).

First, we focus on the results regarding our main variable of interest, *ESI*, with emphasis placed on direct and indirect effects on business cycle synchronization. In the main equation (*BCS*), we find a negative coefficient related to the ESI variable. This holds for all model specifications [Table 2, columns (I)–(IV)]. Our results, therefore, suggest a negative direct effect of the ESI funds on synchronization, i.e., the increasing sum of the ESI payments in the examined country pairs leads to their divergent business cycles.

Such evidence may seem a little surprising at first glance, however, this does not mean that the overall effect of ESI funds on synchronization is negative. Rather, it can indicate that the ESI payments may be procyclical as the EU fiscal policy of which they are a part. Despite the countercyclical efforts, the recent evidence confirms the procyclical nature of the fiscal policy in the European conditions and the fiscal transfers in form of the ECP payments as well (see, e.g., Chmelova 2018; Cronin and McQuinn 2021). The procyclical ESI payments may not simultaneously provide a countercyclical stimulus for the EA economies in the recessionary periods, after which they could follow a similar economic recovery path. Therefore, the ESI payments rather mimic member states' business cycles which can be a fertile ground for the country-specific or industry-specific shocks leading to asymmetric shocks and less synchronized business cycles in the EA.

In this regard, we agree with the view of Coppola and Destefanis (2020), for instance, who claim that the ECP has rather a structural than countercyclical character since the payments are planned ahead for the whole programming period. However, several steps toward countercyclicality have been taken. The first step

[13] For the comparison, we estimate the system using the OLS and the SUR for the full sample where the variable for ESI payments is treated as an exogenous/endogenous variable. These additional results are provided in Table A2 in the Online Appendix, showing underestimation of the OLS.

[14] Because of the unavailability of the more recent ESI data, we are not able to estimate the model including the recessionary period caused by the COVID-19 pandemic.

[15] It must be noted that the major net payers and recipients of the EU budget differ across individual programming periods. For the purposes of this article and considered sample of the EA countries, the term "major net payers" includes the following countries: Germany, France, Italy, the Netherlands, and Austria. The term "major net recipients" (other than Central and Eastern European countries) includes the following countries: Greece, Portugal, Spain, Cyprus, and Malta.

Table 2 The driving forces of the business cycle synchronization (SUR estimation results). *Source*: Own calculations based on data from the European Central Bank, European Commission, Eurostat, IMF, UNCTAD, UNIDO, and the World Bank

	Full sample				Subsample			
			Excl. crisis 08–09		Excl. major payers		Excl. major recipients	
	(I)		(II)		(III)		(IV)	
BCS equation								
Trade	0.7766***	(0.1053)	0.7606***	(0.1121)	0.7738***	(0.1026)	0.8528***	(0.1074)
FDI	0.1549***	(0.0374)	0.1437***	(0.0391)	0.1203***	(0.0366)	0.0940**	(0.0386)
Spec	0.4308***	(0.0391)	0.4885***	(0.0419)	0.3995***	(0.0399)	0.4968***	(0.0393)
GovDef	0.1993***	(0.016)	0.2382***	(0.0169)	0.1874***	(0.0168)	0.1873***	(0.0162)
IncomeSim	−1.0501***	(0.0521)	−1.1097***	(0.056)	−1.1785***	(0.0582)	−1.1911***	(0.0565)
ESI	−0.1539**	(0.0363)	−0.159***	(0.0383)	−0.1698***	(0.0376)	−0.1819***	(0.037)
Edu	0.3671***	(0.0681)	0.3339***	(0.0707)	0.4027***	(0.0708)	0.3193***	(0.0687)
Dev	0.5811***	(0.1609)	0.7234***	(0.1721)	0.7289***	(0.1691)	0.5535***	(0.1739)
R^2	0.6924		0.6901		0.6827		0.6923	
Trade equation								
BCS	0.0251***	(0.0034)	0.0256***	(0.0037)	0.0262***	(0.0036)	0.0274***	(0.0034)
FDI	−0.0499***	(0.0068)	−0.0502***	(0.0072)	−0.0393***	(0.0070)	−0.0221***	(0.0070)
Spec	0.0421***	(0.0073)	0.0426***	(0.0080)	0.0491***	(0.0078)	0.0467***	(0.0074)
ESI	0.1006***	(0.0064)	0.0993***	(0.0068)	0.1194***	(0.0069)	0.1045***	(0.0065)
Dev	0.1233***	(0.0302)	0.1425***	(0.0328)	0.1099***	(0.0329)	0.2015***	(0.0318)
Rule	−0.0249***	(0.0095)	−0.0251**	(0.0104)	−0.0261**	(0.0102)	−0.0258***	(0.0096)
R^2	0.9903		0.9902		0.9889		0.9905	
FDI equation								
BCS	0.0311***	(0.0104)	0.0277*	(0.0115)	0.0258**	(0.0112)	0.0155	(0.0105)
Trade	−0.4009***	(0.0578)	−0.4177***	(0.0637)	−0.3123***	(0.0593)	−0.1668***	(0.0587)
Spec	−0.0474**	(0.0205)	−0.0514**	(0.0227)	−0.0654***	(0.0219)	−0.0534***	(0.0206)

Table 2 (continued)

	Full sample				Subsample			
			Excl. crisis 08–09		Excl. major payers		Excl. major recipients	
	(I)		(II)		(III)		(IV)	
IncomeSim	−0.0842***	(0.0284)	−0.1045***	(0.0315)	−0.1387***	(0.0332)	−0.0953***	(0.0308)
ESI	0.1391***	(0.0191)	0.1505***	(0.0208)	0.1415***	(0.0207)	0.1149***	(0.0193)
Corrupt	−0.1395***	(0.0272)	−0.1535***	(0.0297)	−0.1558***	(0.0295)	−0.1106***	(0.0273)
Edu	−0.1263***	(0.0376)	−0.1382***	(0.0405)	−0.1291***	(0.0412)	−0.1106***	(0.0380)
R^2	0.9197		0.9152		0.9087		0.9223	
Spec equation								
BCS	0.1350***	(0.0103)	0.1505***	(0.0110)	0.1197***	(0.0107)	0.1498***	(0.0105)
Trade	0.2681***	(0.0550)	0.2435***	(0.0589)	0.3080***	(0.0539)	0.2707***	(0.0562)
FDI	−0.0318*	(0.0190)	−0.0322	(0.0199)	−0.0461**	(0.0185)	−0.0393**	(0.0196)
IncomeSim	−0.1635***	(0.0270)	−0.1457***	(0.0293)	−0.2486***	(0.0300)	−0.2142***	(0.0296)
ESI	−0.0139	(0.0188)	−0.0003	(0.0196)	−0.0232	(0.0195)	−0.0117	(0.0192)
Regul	0.0466**	(0.0185)	0.0651***	(0.0200)	0.0461**	(0.0192)	0.0479**	(0.0189)
Inf	0.0453***	(0.0092)	0.0458***	(0.0094)	0.0418***	(0.0096)	0.0433***	(0.0094)
R^2	0.9254		0.9254		0.9225		0.9255	
GovDef equation								
BCS	0.4431***	(0.0238)	0.5046***	(0.0253)	0.3952***	(0.0239)	0.4277***	(0.0242)
IncomeSim	−0.6614***	(0.0624)	−0.5708***	(0.0680)	−0.9593***	(0.0674)	−0.7721***	(0.0686)
Unemp	0.2284***	(0.0244)	0.2622***	(0.0272)	0.2324***	(0.0247)	0.2377***	(0.0244)
Effect	0.1660***	(0.0495)	0.1267**	(0.0533)	0.1492***	(0.0494)	0.1472***	(0.0513)
Inf	0.2453***	(0.0207)	0.2521***	(0.0212)	0.2231***	(0.0210)	0.2491***	(0.0212)
Debt	−0.1409***	(0.0405)	−0.1432***	(0.0446)	−0.1330***	(0.0406)	−0.1490***	(0.0415)
R^2	0.5900		0.5871		0.5928		0.5913	

Table 2 (continued)

	Full sample				Subsample			
			Excl. crisis 08–09		Excl. major payers		Excl. major recipients	
	(I)		(II)		(III)		(IV)	
IncomeSim equation								
BCS	−0.1303***	(0.0069)	−0.1357***	(0.0073)	−0.1230***	(0.0064)	−0.1310***	(0.0064)
FDI	−0.0596***	(0.0136)	−0.0661***	(0.0142)	−0.0693***	(0.0120)	−0.0509***	(0.0130)
GovDef	−0.0556***	(0.0059)	−0.0454***	(0.0063)	−0.0720***	(0.0055)	−0.0522***	(0.0055)
ESI	−0.1044***	(0.0128)	−0.1076***	(0.0135)	−0.0672***	(0.0121)	−0.1095***	(0.0121)
Corrupt	0.0856***	(0.0185)	0.0865***	(0.0196)	0.0798***	(0.0174)	0.0960***	(0.0172)
Dev	0.3884***	(0.0573)	0.4461***	(0.0608)	0.4183***	(0.0545)	0.4261***	(0.0571)
R^2	0.9603		0.9608		0.9654		0.9659	
ESI equation								
Trade	0.8251***	(0.0552)	0.8447***	(0.0607)	0.8757***	(0.0533)	0.8452***	(0.0561)
FDI	0.1090***	(0.0195)	0.1177***	(0.0210)	0.1011***	(0.0189)	0.0917***	(0.0200)
GovDef	−0.0561***	(0.0080)	−0.0637***	(0.0087)	−0.0505***	(0.0083)	−0.0580***	(0.0081)
IncomeSim	−0.1666***	(0.0269)	−0.1845***	(0.0298)	−0.1003***	(0.0297)	−0.2050***	(0.0292)
Corrupt	0.1207***	(0.0270)	0.1255***	(0.0295)	0.1241***	(0.0276)	0.1370***	(0.0272)
Agri	−0.4475***	(0.0254)	−0.4388***	(0.0283)	−0.4408***	(0.0260)	−0.4596***	(0.0265)
R^2	0.9207		0.9163		0.9189		0.9217	
Indiv. effects	YES		YES		YES		YES	
Time effects	YES		YES		YES		YES	
N. of country-pairs	289		289		279		279	
N	2 843		2 480		2 715		2 733	

We provide results using the SUR estimator. Standard errors in parentheses. *$p < 0.1$, **$p < 0.05$, ***$p < 0.01$

regards the 2008–2009 Great Recession, when the ECP assisted in the fiscal stimuli for member states within the European Economic Recovery Plan (European Commission 2009). Nevertheless, the estimation results for the sample excluding the 2008–2009 crisis show a negative coefficient related to the ESI variable, which suggests that the ESI payments are more likely to have been procyclical during 2008–2009 [see Table 2, column (II)].

More recently, the ECP's countercyclicality appeared to a larger extent as a reaction to the COVID-19 pandemic. Building on the Coronavirus Response Investment Initiatives (CRII and CRII+) implemented to increase ECP flexibility, the Recovery Assistance for Cohesion and the Territories of Europe (REACT-EU) promised to deliver €55 billion of additional funds with the main aim of providing a recovery (i.e. a countercyclical measure) for the EU economy after the crisis (European Commission 2020).[16] Not only this effort but also the EC's proposal on the fully-fledged crisis response mechanism for the actual programming period 2021–2027 may convince us of a greater emphasis on the countercyclical functionalities of the ECP in the following periods.

While examining the auxiliary equation for the *ESI* variable (Eq. 7), we observe that a higher sum of ESI payments appears to be in the country pairs experiencing higher trade intensity, bilateral FDI (see positive coefficients related to the *Trade* and *FDI* variables in the *ESI* equation), and similar income and agricultural outputs (see negative coefficients related to the *IncomeSim* and *Agri* variables in the *ESI* equation). Such a profile matches the Central and Eastern European (CEE) countries, which tend to have tight mutual trade relations due to the geographic proximity. Additionally, CEE countries receive FDI mostly from Western Europe and exhibit a high share of agricultural output. CEE countries also receive significant amounts of ECP funding.

Although we find a negative direct effect of the ESI payments on EA synchronization, our findings seem to be in line with the claims of Ahner (2018), who states that the ECP moved the EU toward an optimum currency area where the business cycle synchronization is assumed to be the crucial condition, or limited evidence provided by Dicharry and Stiblarova (2023). This is because the total effect of ESI payments is positive as the positive indirect effects of the ESI payments outweigh the direct negative one. We summarize all the effects of the ESI payments in Table 3.

Regarding indirect effects, we first find a positive indirect effect of the ESI payments on synchronization via the *Trade* variable. Investment from the ECP may support foreign trade because of the Keynesian multiplier effects reflecting the growth of private consumption. Such evidence of the positive ESI effect on trade balance has been observed by, for instance, Bradley et al. (2007) or Monfort and Salotti (2021).

We also discover the second indirect channel through which the ESI payments support synchronization; increasing investment from the ECP promotes the EA business cycle synchronization through bilateral FDI (see a positive coefficient related to

[16] These financial resources were planned to be distributed under the ERDF, ESF, and the European Fund for Aid to the Most Deprived (FEAD) in the programming period 2014–2020. In 2021–2022, the resources were planned from Next Generation EU.

Table 3 Direct, indirect, and total effects of the ESI funds. *Source*: Own calculations based on data from the European Central Bank, European Commission, Eurostat, IMF, UNCTAD, UNIDO, and the World Bank

	Full sample		Subsample	
		Excl. crisis 08–09	Excl. major payers	Excl. major recipients
	(I)	(II)	(III)	(IV)
Direct: α_6	−0.1539	−0.1590	−0.1698	−0.1819
Indirect:				
Via trade: $\alpha_1.\beta_4$	0.0781	0.0755	0.0924	0.0891
Via FDI: $\alpha_2.\gamma_5$	0.0215	0.0216	0.0170	0.0108
Via spec: $\alpha_3.\delta_5$				
Via incomesim: $\alpha_5.\eta_4$	0.1096	0.1194	0.0792	0.1304
Total	0.0553	0.0575	0.0188	0.0484

Direct and indirect effects of the ESI variable are calculated from the SUR estimation results provided in Table 2 [columns (I)–(IV)]. We only report the statistically significant effects

the *ESI* variable in the *FDI* equation). Our results therefore validate previous empirical studies showing that payments in the ECP are associated with increased FDI in the recipient countries (e.g., Breuss et al. 2010).

Although ESI payments seem to decelerate the specialization among the member states (see a negative coefficient related to the *ESI* variable in the *Spec* equation), the effect has not been confirmed to be statistically significant. However, in line with Antonakakis and Tondl (2014), we confirm that countries converging in income levels in terms of GDP per capita tend to experience similar business cycles. At the same time, ECP has proved to have a positive effect on decreasing income gaps among considered country pairs (see a negative coefficient related to the *ESI* variable in the *IncomeSim* equation). This process creates the third indirect channel of the ECP via income similarity.

Together, these positive indirect effects exceed the negative direct effect of the ESI payments, which suggests a total positive effect of the ESI funds on the business cycle synchronization in the selected sample. The results remain quantitatively similar and thus robust while alternating our system of equations using different samples, namely the full sample, and while excluding the 2008–2009 crisis, major net payers, or recipients.[17] We also test the robustness using alternative measures of the business cycle synchronization, trade intensity, FDI, government deficit, and the ESI funds separately. These results are provided in Table A3 in the Online Appendix.[18]

In addition to the ESI payments, most of the assumptions about the driving forces of the business cycle synchronization have been fulfilled. In all model specifications

[17] It is worth mentioning that the total effect of the ESI funds slightly decrease if the major net payers are excluded from the sample. This appears to be mainly due to the income similarity channel.

[18] While the models estimated using alternative variables appear to be robust, we cannot confirm the robustness of the indirect channel of specialization in the case of separate funds. Thus, these results should be taken with caution. Similarly, various effects for separated funds in a different context can be found, for instance, by Staehr and Urke (2022).

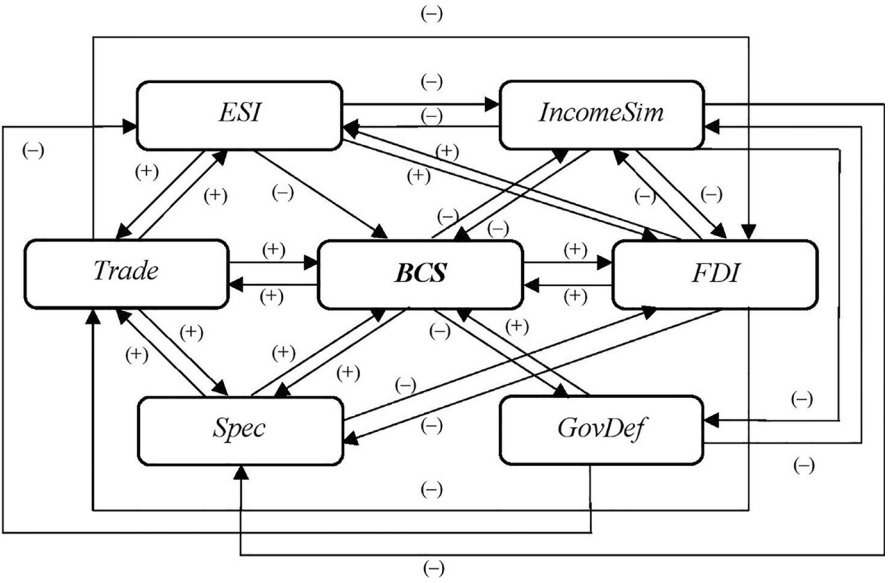

Fig. 1 Direct and indirect effects in the simultaneous equations model. *Note*: We depict only statistically significant direct/indirect effects of the endogenous variables in the model specification for the full sample (Table 2, column (I)). Symbols (+)/(−) depict a positive/negative effect. *Source*: Own calculations based on data from the European Central Bank, European Commission, Eurostat, IMF, UNCTAD, UNIDO, and the World Bank

(Table 2, columns (I)-(IV)), we find a positive direct relationship between trade intensity and synchronization, which is in line with, for example, Abbott et al. (2008), Baxter and Kouparitsas (2005), Bower and Guillemineau 2006, and Frankel and Rose (1998). At the same time, the reverse relationship, that is, the positive coefficient related to the BCS variable in the *Trade* equations, is confirmed as well (see Fig. 1 depicting effects among all endogenous variables in the system). This finding suggests that more synchronized member states seem to have more intense trade linkages in the EA.

Examination of the auxiliary equation for trade intensity reveals a negative coefficient related to the *FDI* variable, which suggests that horizontal FDI may act as a substitute for trade (Hsu et al. 2011). Our assumptions about the positive effect of specialization on trade have been confirmed as we observe a positive and statistically significant coefficient related to the specialization variable (*Spec*) in the *Trade* equation. This result is indicative of EA inter-industry trade. At the same time, we find that trade intensifies with increasing economic development (a positive coefficient related to *Dev*), suggesting prominent trade volumes between more developed EA countries. Therefore, we confirm the previous assumptions about more synchronized and developed "*core*" EA countries.

From the main equation (*BCS*), we also find that increasing bilateral FDI between the considered country pairs has a positive effect on their synchronization, validating the evidence of Imbs (2004), for example. Examining the auxiliary equation of

FDI (Table 2), we observe a negative coefficient related to *Trade* in the *FDI* equation (the same holds for *FDI* in the *Trade* equation), which suggests the previous claims about horizontal FDI. Negative coefficients related to specialization (*Spec*) and income similarity (*IncomeSim*) confirm the results of Hsu et al. (2011) regarding a rise of FDI in countries with a similar economic structure and income level. We also see that country pairs converging by their corruption perception and shares of educated population tend to be related to higher levels of FDI.

Specialization appears to have a positive direct effect on synchronization (the main *BCS* equation), and reverse positive causality is confirmed as well (see Fig. 1). Our evidence, therefore, does not meet the assumptions that more specialized country pairs should react to exogenous (country-specific or sector-specific) shocks differently. To the contrary, the results suggest that more specialized country pairs tend to have more similar business cycles. Similar evidence is also provided by Antonakakis and Tondl (2014), who explain that specialized economies may still produce complementary goods without creating specific demand shocks, that is, less synchronized business cycles.

From the auxiliary equations of specialization (*Spec*), we find that intensified trade linkages may result in industry concentration considering that we find a positive coefficient related to the *Trade* variable. This result confirms the classic Ricardian theory and previous empirical findings (Calderon et al. 2007; Imbs 2004). Conversely, the increase in FDI decelerates specialization among the country pairs, validating the results from the *FDI* equation. The horizontal FDI in the sample seems to be promoted mainly in the country pairs of similar economic structures. Among the remaining exogenous regressors, we see that diverging regulatory quality and inflation tend to lead to a higher level of specialization.

Surprising evidence has been found for the government deficit (*GovDef*). In particular, we observe a positive relationship between fiscal divergence and business cycle synchronization in all model specifications (see Table 2). From the auxiliary equations for *GovDef*, we see that this relationship is also reversed (see the positive coefficient related to the *BCS* variable).

The results, therefore, suggest that diverging EA member states' fiscal policies helped them to become more synchronized. This evidence is in contrast to the findings of Darvas et al. (2005), who claim that converging fiscal positions should result in more synchronized cycles. However, it is essential to recall that during the Great Recession (2008–2009), the member states' governments applied diverse fiscal instruments to combat this recessionary period. At the same time, countries showed more synchronized cycles because they experienced a similar drop in economic activity. Similar findings, however, are observed in the sample excluding the crisis 2008–2009 (Table 2, column [II]). Thus, diverging fiscal positions could serve as one of the adjusting instruments aimed to alleviate disturbances from the crisis.

While examining the auxiliary equation of *GovDef*, we see, for instance, that a converging institutional environment in terms of government effectiveness mitigates discrepancies in fiscal positions. The same relationship does not hold for income similarity—we find that country pairs with similar levels of real GDP per capita tend to show diverging fiscal positions. The reverse relationship is also confirmed in the income similarity (*IncomeSim*) equation. In Eq. 6, we confirm that income

convergence, that is, a decreasing gap in income levels, is positively related to more synchronized business cycles as in Antonakakis and Tondl (2014). These alleviating disparities mostly occur in countries of lower economic development (a positive coefficient related to the variable *Dev* in the *IncomeSim* equation). Moreover, FDI, ESI payments, and institutional convergence have been confirmed as driving forces boosting income similarities. Overall, our results remain robust across all model specifications.

5 Conclusions

The aim of this paper was to closely investigate the side effects of the ECP regarding EA business cycle synchronization. To achieve this objective, we examined the direct and indirect ECP effects related to the core business cycle synchronization driving forces, such as trade intensity, FDI linkages, specialization, but also income similarity. To the best of our knowledge, this analysis is novel and the examination was conducted for the EA countries in 2000–2019 using the simultaneous equations framework. Results show that increasing ESI payments within the Cohesion Policy overall contributed to more synchronized EA business cycles. Even though we observe a direct negative effect of the ECP on EA synchronicity due to the procyclical character of the ECP, ESI payments seem to have a total positive effect on the synchronization due to positive indirect effects, confirming previous claims about the contribution of the Cohesion Policy to the OCA in the Eurozone.

We find that the benefits of the ECP for synchronicity in the EA lie in its indirect effects through trade, FDI, and income similarity. The financial resources from the ECP promote foreign trade between member states, which has been considered in previous empirical studies as the most significant business cycle driving forces thus far. A similar effect has been confirmed for bilateral FDI and income similarity—an increase in the ESI payments supports EA synchronization via increased FDI and alleviated income disparities. Despite various criticism of the ECP regarding its efficiency, we show that there is a rationale behind increasing ESI payments within the common EU budget due to the side effect in the form of increased synchronization in the EA. At the same time, the promotion of tighter trade linkages and bilateral FDI is directly justified for synchronization purposes but also concerning the Cohesion Policy.

The results of the present paper regarding the direct effect of the ECP suggest that it is advisable to implement and extend its countercyclical features. These features can not only help EU member states tackle deeper recessions but also synchronize their business cycles through the direct effect of the ECP (now only acting as the decelerating force due to the procyclicality). This presents a prerequisite for the creation of the OCA in the EA. From this point of view, the continuing integration within the European continent is no less important as the Cohesion Policy contributes to member states in the monetary union as well as EU countries with their own monetary policy. The paradox is that these countries represent the largest recipients of the ECP (e.g., the majority of the CEE countries), and the absence of common

monetary (or fiscal) adjustments may mitigate any potential positive side effects regarding synchronization due to the possible creation of asymmetric shocks.

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Availability of data and material Data supporting the findings of this study are available from the corresponding author upon request.

Code availability Not applicable.

Declarations

Conflict of interest The author has no relevant financial or nonfinancial interests to disclose.

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