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FROM ECONOMIC TRANSITION TO THE MONETARY UNION

Empirical elements regarding the CEECs, in the context of the European Union.

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"L'Europe doir respirer avec ses deux poumons:
celui de l'Est et celui de l'Ouest."

— Jean-Paul II[1]

To Beloved, to the Fool. . .

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[1] Citation, tirée de la traduction officielle, faite par L'Osservatore Romano (datée du 10 juillet 2001), de l'allocution de Jean-Paul II, pour l'angelus en date du 29 juin 2001, à son retour d'Ukraine. La notion de poumons ayant, elle-même, été empruntée par Jean-Paul II, à Viatcheslav Ivanov et Mikhail Gerchenson, dans l'ouvrage "Correspondance d'un coin à l'autre", traduction de C. Du Bos et H. Iswolsky parue dans Vigile, numéro 4, 1930, disponible en ligne.

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Clermont-Ferrand, 26 mai 2021   P. L.

Abstract

"The subject matter of international economics, then, consists of issues raised by the special problems of economic interaction between sovereign states."[2]
Institutional innovation fosters the development of these interactions. Thus, European states, on a social background,[3] try to benefit from the cooperation leverage effect, to turn centuries of conflicts, into an economic asset. Such a construction and its pantagruelian twists and turns, as a fusion of history and empires, not far from Victor Hugo's utopia "the United-State of Europe",[4] demonstrates the incredible ingenuity, national heterogeneities develop to refine the paradigm "Europe".

In this thesis, we propose to shed some light on some of these challenges, with regard to the countries which, not half a century ago, marked the fracture of the continent, CEECs. These economies, from transition to developed economy, are an unprecedented case study, to understand international economic challenges. After explaining the general framework, in which this work takes place (Chapter 1), we investigate the impact of the ECB's monetary policy, on the peripheral countries of the euro zone, i.e., EU non-Euro members. In chapter 2, we construct two groups of countries, depending on their exchange rate regime (fixed or flexible). Drawn upon this construction, using monetary, price and output data, we measure the impact of a monetary shock, impulsed by the ECB, on the CEECs. We find that economic integration induces spillover effects, that influence domestic monetary decisions. As expected, pegged economies are more strongly affected, by the monetary policy of the ECB. However, in both groups of countries, we find that spillovers tend to have less impact, on the volatility

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[2]Extract from Krugman et al. (2011). International Economics. *Pearson*. Edition 9th - Chapter 1 - Introduction (page 3)

[3]In 2012, the EU receives the Nobel Peace Prize. The Nobel Committee thus declared that "the Union and its precursors for over six decades contributed to the advancement of peace and reconciliation, democracy and human rights in Europe"

[4]Victor Hugo, extract from the opening speech of the International Peace Congress in Paris, August 21, 1849: "A day will come when those two immense groups, the United States of America, and the United States of Europe, shall be seen placed in presence of each other, extending the hand of fellowship across the ocean, exchanging their produce, their commerce, their industry, their arts, their genius..."

Abstract

of our variables (GDP and prices), over the last decade. We explain this, via a more efficient exchange rate channel, to absorb shocks (in flexible exchange) and an increased credibility of domestic monetary institutions.

We highlighted that spillovers effects significantly influence the CEECs, with direct impact upon domestic monetary challenges. The first phase of the transition, during the 90's, has been hit by high level of both inflation and unemployment. Over the last years, inflation seems to be under control, and we observe relatively low unemployment rate, closed to its natural level. This could suggest that monetary credibility has been restored. However, in the process of accession to the Euro zone, monetary leeway is becoming increasingly restricted. Throughout Chapter 3, we use the well-known Phillips curve, to understand the relationship between the unemployment rate and price developments, as a proxy for the effectiveness of monetary policy. The Baltic States, Slovenia and Slovakia are perfect candidates to measure the impact of changes in exchange rate regimes, during accession to the EA. During the ERM-II, the relationship is negative and significant. However, the EA entry is prima facie evidence of a flattened Phillips curve. We explain this result by the fact that in a monetary union, "small" economies do not have sufficient power, to significantly influence monetary policy decisions.

To be fully effective, the single policy of the ECB must confront, relatively homogeneous economies. This homogeneity transcends the monetary dimension and directly affects the real economy (evidenced by the Phillips curve). The impact of asymmetric shocks are smoothed through the adjustment mechanisms in an optimal union. Among these mechanisms, we highlight the role of the labour market, which requires flexibility (of wages) and increased factor mobility. Chapter 4 analyses regional adjustment mechanisms, after an exogenous employment shock. Using regional NUTS-II data, we build a VAR panel, to understand these mechanisms. We introduce different heterogeneities and find that the labour participation rate is relatively more sensitive, in the CEECs than in the EU-15 and that women are, all the more, in a vulnerable situation. We also find that poor regions, within the EU-28, adjust less quickly after a shock, leading to persistence, in negative effects, such as unemployment.

To provide an institutional response to the labour market impairments, of the labour market, we must offer a comprehensive understanding of labour supply, as an effective adjustment mechanism. This flexibility is defined in the sense of inter-regional mobility but also in intersectoral mobility. Increasing intersectoral mobility is possible through training, education. As part of the EU-2020 strategy, increasing the level of education, of population, is a pillar of European policies, while significant disparities persist between countries. We build an

econometric model derived from a growth equation. Chapter 5 provides some answers, to the question of financing education. To do this, we go beyond the pure European framework and use panel data, on a set of middle- and high-income countries. We focus on public spending on education, as a proxy for human capital flows. While the relationship is significant in high-income countries, it does not hold in the lower group. We then use an efficiency index and find that the impact of public spending on education, on growth, is significant in countries, whose spending is relatively efficient in generating human capital. We observe that increasing the budgetary effort, per se., is not an adequate response, if not associated by a joint increase in human capital.

Résumé détaillé

"Le sujet de l'économie internationale consiste, donc, en des questions soulevées, par les problèmes particuliers, de l'interaction économique, entre États souverains."[5]
L'innovation institutionnelle se met au service de ces interactions. Ainsi les pays européens, sur fond social,[6] tentent d'utiliser le levier de la coopération économique, pour permettre à des siècles de conflits, de se transformer en atout économique. Une telle construction, aux pantagruéliques rebondissements, fusion d'Histoire et d'empires, non loin de l'utopie *États-Unis d'Europe* de Victor Hugo,[7] démontre l'incroyable ingéniosité, avec laquelle les hétérogénéités nationales semblent parfaire le paradigme *Europe*.

Nous proposons, dans cette thèse, d'éclairer certains de ces défis, au regard des pays qui, il n'y a pas un demi-siècle, marquaient la fracture du continent, les PECO. Ces économies, passées du stade *en transition* à *économie développée*, sont un cas d'étude sans précédent pour la compréhension des défis économiques internationaux.

Chapitre 1

Nous allons nous servir, du chapitre 1, pour expliciter le cadre général, autour duquel s'articulent nos travaux. Bien que les notions même de commerce international, de coopération et d'intégration économique soient clairement établies en Sciences Economiques, il semble bon de rappeler toute leur importance, afin de comprendre les raisons qui poussent les Etats vers un subtil équilibre de compétition et de coordination. Les théories des gains à l'échange

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[5]Traduction, extrait de Krugman et al. (2011). International Economics. *Pearson*. Edition 9th - chapitre 1 - Introduction (page 3).

[6]En 2012, l'UE reçoit le prix Nobel de la paix. Le Comité du Nobel a ainsi déclaré que "l'Union et ses précurseurs ont contribué pendant soixante ans aux progrès de la paix et de la réconciliation, de la démocratie et des droits de l'homme en Europe" en faisant "passer l'Europe d'un continent en guerre à un continent en paix."

[7]Victor Hugo, extrait du discours d'ouverture du Congrès International de la Paix à Paris, le 21 août 1849 : "Un jour viendra où l'on verra ces deux groupes immenses, les États-Unis d'Amérique, les États-Unis d'Europe, placés en face l'un de l'autre, se tendant la main par-dessus les mers, échangeant leurs produits, leur commerce, leur industrie, leurs arts, leurs génies."

remontent au XVIII, alors que les nations européennes tentent d'élargir les frontières du *vieux continent*. La consécration même du commerce international et de sa primauté, dans le context Européen, apparait pleinement dans le projet de la contruction de l'Union Européenne, comme la pierre angulaire, posée au cours des années 1950, pour assurer une paix sociale.

Tandis que l'impact contemporain, tant économique que social, de la CECA[8] ne tarde pas à se faire sentir, les limites d'un marché commun pointent rapidement à l'horizon. Bien que les institutions tentent de promouvoir un cadre élargi de la compétition-coopérative sur le marché unique, en favorisant la libre circulation, l'espace Schengen ne semble pas suffisant pour assouvir les objectifs de l'UE. Ce sont les prémices de l'union monétaire. Les récents travaux de Mundell (1961), sur la théorie de la zone monétaire optimale, viennent affermir l'idée que pour optimiser les échanges, il faut supprimer la barrière de la monnaie. Faisant fi du risque de change, une monnaie unique, sur laquelle les monnaies domestiques viennent s'ancrer, soutient le projet européen et semble répondre à une dynamique économique sur fond politique. Les conséquences, a priori négatives, de la monnaie unique, telles que la perte de la souveraineté monétaire devraient être absorbées par le gain économique, si tant est que la zone monétaire s'inscrive dans une démarche de convergence et de synchronisation. Les chocs idiosyncratiques ne peuvent alors plus être résorbés via le canal monétaire, ce qui suggère un impératif d'homogénéisation intra-zone, d'une flexibilité accrue des facteurs de production, ainsi qu'une politique budgétaire solide.

Il semblerait bien que ce premier quart du XXI s., soit marqué par la marche progressive, vers les limites de l'union monétaire, dans laquelle le volet fiscal est volontairement réduit à un rôle marginal. Un tel choix, fondamentalement politique, vient se heurter à la théorie de Mundell (1961) et semble freiner les mécanismes d'ajustements budgétaire et fiscal qui permettraient selon de récentes études (Bénassy-Quéré, 2016), une efficience accrue des politiques faces aux chocs asymétriques.

C'est au coeur de ces débats, à la fois politiques, idéologiques et économiques, que l'Union Européenne, à l'aube du XXI s., se tourne vers l'Est. Une décennie après la transition d'une économie planifiée, à une économie de marché, les PECO[9] ont connu une profonde transformation de leur économie. Les privatisations et restructurations, concomitantes à la libéralisation, s'accompagnent d'une montée endogène du chômage (alors quasiment inexistant) et d'une inflation galopante (fin du contrôle des prix).

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[8]CECA : Communauté Économique du Charbon et de l'Acier

[9]PECO : pays d'Europe Central et Orientale ; nous retiendrons ici la liste des pays faisant partie des dernières vagues d'élargissement de l'UE, à savoir Bulgarie, République Tchèque, Estonie, Croatie, Hongrie, Lettonie, Lituanie, Pologne, Roumanie. Nous excluons ainsi volontairement les pays issus de l'ancienne Yougoslavie ainsi que l'Albanie, tout autant que les anciennes républiques soviétiques dont l'inclusion dans les PECO est sujet à débat.

Cette stabilisation macroéconomique, quoique brutale, s'accompagne d'une convergence européenne, avec une augmentation accrue du commerce intra-union. La transition a également permis aux autorités monétaires domestiques, de restaurer leur crédibilité alors que l'accès à la zone euro est fortement conditionné à la stabilité monétaire, proxy de l'efficience des banques centrales. De récentes études montrent la capacité de certains PECO à entrer dans la zone Euro. Cependant se pose la question, dans le court-moyen terme, de leur volonté d'adhésion au projet monétaire européen.

Désormais que le cadre est posé, c'est dans ce contexte international, multidimensionnel, que nous venons poser notre questionnement et plus largement nourrir, notre réflexion, appuyée par nos travaux. Cette trame, préquelle du corps de notre thèse, nous permet de conduire prudemment le lecteur, des challenges monétaires et des frictions sur le marché du travail au défi du capital humain dans la croissance.

Chapitre 2

Tandis que l'année 1992 marque les fondations de l'union monétaire, le marché commun et la libre circulation entrouvrent la voie, à un système bancaire renforcé. Tout s'accélère avec les tumultes, nés de la crise économique de 2008 et accentué par la crise des dettes souveraines de 2012, au sein de l'UE. Le renforcement de la supervision bancaire devient indubitablement indispensable. Les conséquences de ces chocs, au sein de la zone Euro, influencent les PECO, en autre, via le canal bancaire, puisque le secteur bancaire de ces pays est caractérisé par une proportion élevée de filiales étrangères (EBF, 2019).

En attendant leur entrée dans l'UEM, les six économies restantes de l'UE, toujours aux portes de la zone euro, font partie du système européen de banques centrales, mais conservent leur autonomie monétaire. C'est le cas de la République Tchèque, de la Hongrie, de la Pologne et de la Roumanie, qui choisissent un régime de taux de change flexible. L'entrée dans l'Union Européenne est conditionnée à l'adhésion à la zone Euro, ce qui pour les gouvernements, signifie à moyen terme, de répondre aux exigences économiques de l'UEM. L'augmentation de l'interdépendance, entre les économies de l'UE, pose la question des impacts monétaires de la BCE sur les membres de l'UE non-membres de la zone euro. Le chapitre 2 tend à apporter de nouvelles perspectives, quant à l'impact de la politique de la BCE sur l'économie réelle des PECO et sur la manière dont la politique monétaire intérieure s'adapte, à la fois pour mettre en œuvre une stratégie nationale et pour répondre au cadre de l'UE et de la BCE.

L'article suit le récent papier de Rey (2015) qui a suggéré un dilemme au lieu d'un « trilemme » pour étudier l'importance de la politique monétaire. Nous complétons les travaux antérieurs de Jarocinski (2010), Babecká Kucharcuková et al. (2016) et Hajek et Horvath (2018)

pour comprendre le rôle joué par la BCE dans l'explication à la fois de la politique monétaire intérieure et de l'évolution des variables économiques, telles que la production et les prix. Nous proposons également une analyse plus approfondie, dans laquelle le taux monétaire de la BCE influence la volatilité des variables domestiques à moyen terme en examinant la décomposition de la variance.

Littérature

Depuis les récents articles de Rey (2015, 2016), la question des spillovers monétaires regagne de l'intérêt (Han et Wei, 2018 ; Hajek et Horvath, 2018). Ces effets de débordements sont intrinsèquement associées au débat sur les avantages et les inconvénients de la coordination monétaire internationale (Clarida et al., 2002 ; Corsetti et Pesenti, 2005 ; Taylor, 2013). Les facteurs mondiaux, induits par les centres économiques, influencent directement les petites économies ouvertes (Mackowiak, 2007 ; Fratzscher et al., 2016). Selon Aizenman et al. (2016) et Georgiadis (2016), l'ouverture financière et la stabilité du taux de change dans les « économies périphériques » sont d'un intérêt primordial pour comprendre le niveau des retombées monétaires.

L'importance des flux de capitaux et de l'instabilité provenant d'un choc monétaire international a été récemment théorisée dans Plantin et Shin (2018) et tend à soutenir l'idée que de petits changements peuvent induire des fluctuations importantes dans une petite économie ciblant l'inflation, avec un taux de change flexible. Canova (2005) et Forbes et Warnock (2012) mentionnent l'importance de prendre en compte les flux financiers, résultant des variations des taux directeurs étrangers. En examinant la politique de la Fed, Bruno et Shin (2015) puis Buch et al. (2019) mettent en évidence les retombées monétaires et le rôle sous-jacent du secteur bancaire.

Les taux d'intérêt étrangers sont un canal potentiellement important, affectant l'économie nationale (di Giovanni et Shambaugh, 2008 ; Hofmann et Takats, 2015). Cependant, la récente crise économique mondiale de 2008 a poussé les banques centrales vers les taux planchers. Des études récentes comme Chen et al. (2016) ou Tillmann (2016) utilisent des mesures d'assouplissement quantitatif pour extraire les impacts monétaires, tirés par la Fed, sur les pays émergents. Ils ont constaté que les retombées des politiques monétaires non conventionnelles avaient un impact significatif sur les économies périphériques.

En regardant l'UE, Fratzscher et al. (2016), à travers la politique monétaire non conventionnelle de la BCE, se concentrent sur le marché financier et trouvent des retombées positives à la fois sur les marchés d'actions et sur la confiance dans les PECO. Pour Horvath & Voslarova (2017) et Moder (2017), les politiques non conventionnelles de la BCE ont un impact positif sur la

croissance de la production et l'inflation dans les PECO.

En raison de leur intégration économique avec la zone euro, les retombées monétaires conduisent à une forte réponse économique dans les PECO (Fadejeva et al., 2017). Feldkircher (2015) et Potjagailo (2017) ont constaté des retombées significatives des politiques monétaires de la BCE, malgré un canal hétérogène, dépendant de l'ouverture commerciale, du développement financier ou du régime de taux de change.

Faits stylisés

L'indice du PIB donne un aperçu intéressant du comportement de croissance économique dans notre groupe de pays. L'impact de la crise économique a été prononcé dans les PECO, en particulier en Croatie et en Bulgarie avec un lent processus de reprise. Cependant, la République Tchèque, la Hongrie et la Roumanie, malgré une rupture de série au début de la crise, sont rapidement revenues à leur tendance à la hausse. Entre 2010 et 2017, le taux de croissance annuel moyen du PIB a atteint 1,35% à l'intérieur de la zone Euro. Dans les pays à la frontière, à l'exception de la Croatie (0,55% sur la période), le taux de croissance moyen s'établit à 2,57% et culmine à 3,3% en Pologne.

Suite à la libéralisation des années 90, un défi institutionnel a été de lutter contre la forte volatilité des prix, qui induisait trop d'incertitudes pour engager des réformes structurelles cohérentes. Au regard des données sur les prix, l'inflation converge vers des niveaux soutenables, dans une période relativement courte et tendent, a priori, à se stabiliser sur la dernière décennie.

Sur le marché monétaire, les spreads de taux suivent la même inclination et convergent vers les standards européens. Une telle convergence reflète en partie la crédibilité des institutions monétaires, comme l'un des principaux objectifs des PECO, afin de justifier et de mettre en œuvre, par la suite les réformes et leurs programmes d'investissement à long terme.

Méthodologie économétrique

L'approche empirique permettant d'évaluer l'impact des spillovers monétaires sur les variables réelles, consiste à utiliser une spécification VAR pays par pays. Cette approche a été généralisée par Sims (1980) et Engle et Granger (1987). L'approche panel-VAR est particulièrement intéressante car elle surmonte les limitations économétriques habituelles. La spécification VAR, c'est-à-dire un modèle de panel dynamique, utilisant un estimateur LSDV, fournit un schéma d'identification puissant pour traiter à la fois le problème des effets fixes et l'endogénéité (Bun et Kiviet, 2006).

Résumé

Pour investir les spillovers monétaires internationaux, une première estimation avec des variables stationnaires est réalisée, où le vecteur des variables endogènes comprend l'indice du PIB réel, le déflateur du PIB comme proxy des prix, le taux réel du marché monétaire domestique, à 3 mois, le taux de change effectif réel et l'Euribor à 3 mois. Les politiques non-conventionnelles de la BCE nous amènent à privilégier l'uilisation du « shadow rate » de Wu et Xia (2016) à la place de l'Euribor.

Un atout de l'utilisation de VAR réside dans la possibilité de dessiner la fonction de réponse (IRF) et la décomposition de la variance de l'erreur (FEVD). En ordonnant les variables, la décomposition de Cholesky résout la contrainte d'orthogonalité des erreurs. En effet, l'utilisation d'un ordre spécifique suppose que la variable, en première position, ne soit pas simultanément impactée par les autres variables du modèle.

Nous considérons le taux de la BCE comme la variable la plus exogène, les PECO ne faisant pas partie du conseil de la BCE. Ainsi, le taux de la BCE est placé en première position. Puis est introduit le taux de change car il dépend fortement de la situation nationale et internationale. Ensuite, nous ajoutons des mesures de production et de prix pour obtenir l'impact sur l'économie nationale. Enfin, le taux d'intérêt domestique suppose que les banques nationales considèrent, à la fois la politique de la BCE et les variables internes pour définir leur politique monétaire. Par conséquent, le taux de la BCE peut influencer simultanément le taux intérieur mais l'inverse n'est pas vrai (Clarida et al., 2002). Comme il n'existe pas de consensus strict concernant l'ordre causal, nous avons inversé les ordres de production et de prix, dans la robustesse, en maintenant le taux de la BCE comme le plus exogène. Les résultats restent cohérents et similaires à l'estimation principale.

Résultats

Nous nous intéressons d'abord à la réponse impulsionnelle, estimée sur trente trimestres, des quatre variables endogènes, après la simulation d'un choc positif sur le taux de la BCE (un choc d'un écart-type). Nous constatons que le taux de change effectif réel réagit rapidement, positivement et significativement.

Du point de vue de la production, après une brève réaction positive du taux de croissance du PIB, nous observons un retour à la tendance de long terme. L'impact positif a déjà été constaté dans la littérature (Minea et Rault, 2011) et peut être interprété comme la conséquence de l'intégration des économies dans l'UE. Les agents anticipent une hausse future de leurs taux intérieurs, car leur politique monétaire se rapproche de celle de la BCE. Ce différentiel de taux d'intérêt positif, à très court terme, favorise le domestique, induisant une augmentation de l'investissement et donc du PIB. La réaction négative, qui s'ensuit, converge vers l'idée qu'une contraction monétaire, de la BCE, a un impact sur l'économie domestique. Ces premiers

résultats corroborent d'autres études empiriques, mettant en évidence un effet significatif, persistant et suffisamment large pour être pris en considération (Clarida et al., 2002 ; Gavin et Kemme, 2009 ; Hajek et Horvath, 2018).

L'absence générale de réaction sur les prix intérieurs peut s'expliquer par un policy-mix "agressif", contre l'inflation, comme mentionné précédemment. En effet, les politiques structurelles, concernant la forte volatilité des prix, combinées à la stratégie de ciblage de l'inflation, peuvent lisser l'impact des chocs monétaires externes sur l'inflation.

Le taux d'intérêt monétaire domestique ne réagit pas de manière significative au choc monétaire de la BCE. Nous expliquons l'absence de débordements, de la BCE, vers les taux monétaires des PECO, par l'introduction du taux de change effectif réel qui absorbe l'essentiel du choc. Nous contrôlons la bonne spécification de notre modèle, en regardant la réponse du PIB après un choc sur le taux d'intérêt intérieur. Le résultat négatif sur le PIB est cohérent avec ce qui était attendu.

Pour comprendre dans quelle mesure le régime de change peut jouer un rôle, sur l'importance des retombées monétaires internationales, nous comparons les résultats précédents avec des pays sous régime fixe. Nous n'introduisons pas le taux de change, dans la spécification VAR. Comme la politique monétaire intérieure, importe la politique de la BCE, encore plus dans le cas d'une caisse d'émission, nous modifions notre ordre de Cholesky, introduisant le taux intérieur en deuxième position, avant la mesure du PIB et des prix.

On observe une réaction positive du taux intérieur, après trois périodes, cohérente avec l'"importation" de la politique monétaire de la BCE. La contraction monétaire entraîne une diminution significative du taux de croissance du PIB, parallèlement à la hausse des taux intérieurs. L'indice des prix met en évidence un comportement similaire avec un certain retard.

La décomposition de la variance

La décomposition de la variance permet d'identifier à quel point une variable joue un rôle dans la volatilité d'une autre. Sur l'ensemble de la période, dans les pays à change flexible, la politique monétaire de la BCE semble avoir joué un rôle significatif, dans la variance moyen-long terme du PIB, puisqu'elle représente plus de 20% de la variance expliquée, trois ans après la simulation du choc. Cependant, en fin de période, l'impact a quasiment disparu. A l'inverse, l'impact du taux de change effectif réel, jugé marginal, sur l'ensemble de la période, augmente légèrement après 2010. Ceci peut être interprété comme une efficacité croissante de la politique monétaire intérieure.

Les retombées monétaires relativement importantes de la BCE vers le PIB intérieur sur l'ensemble de la période peuvent s'expliquer par deux canaux. Le premier est le phénomène

d'euroisation qui entrave la politique monétaire intérieure. En effet, en cas d'augmentation des taux monétaires de la BCE, les ménages ont tendance à augmenter leur épargne libellée en euros, ce qui est contre-productif. Au niveau national, les entreprises, dans la même situation, ont tendance à augmenter leurs investissements, en monnaie nationale, car il devient relativement plus rentable de le faire. La baisse de l'euroisation au cours des dernières années vient confirmer les plus faibles spillovers observés. Le deuxième canal est expliqué par la réaction des économies domestiques aux impacts de la BCE sur la production de la zone Euro dont dépendent fortement les PECO.

Pour mieux comprendre ce phénomène, on peut se pencher sur la part des exportations des PECO, consacrée aux Etats membres de la zone euro. Les données disponibles sur Eurostat révèlent qu'en 2015, les exportations de la Hongrie, de la Pologne et de la Roumanie vers l'UEM représentent respectivement 55%, 45% et 55% de leurs exportations totales. Ainsi un ralentissement économique dans la zone Euro va directement influencer l'économie réelle des PECO.

Chapitre 3

Alors que nous venons de voir que des effets de débordement agissent dans les PECO, nous ne pouvons nous empêcher, de relier cela aux enjeux budgétaires et monétaires domestiques. Effectivement, l'UE s'est dotée d'un pacte de stabilité et de croissance, dont un des principaux objectifs est de favoriser la coordination, l'efficience et la soutenabilité fiscale, d'autant plus importante lorsqu'un pays abandonne sa souveraineté monétaire.

Par ailleurs, tout pays désireux d'adhérer à la monnaie unique, doit passer par le mécanisme de taux de change qui vient contraindre les fluctuations du taux de change, dans une "bande" prédéterminée, autour d'un taux pivot, pour une période d'au moins deux ans.

Nous comprenons alors toute l'importance de la politique budgétaire des pays, pour assurer une cohérence avec cette double contrainte monétaire et fiscale. Pour les pays participants au MCE-bis, les conséquences sur la discrétion du policy-mix semblent encore plus importantes. En effet, les marges de manoeuvre monétaires sont fortement réduites, avec une part significative d'"importation" de la politique monétaire de la BCE et peu ou pas d'ajustement via le taux de change. Un des outils de mesure de l'efficacité de la politique monétaire, revient à observer la relation entre l'inflation et le taux de chômage. En effet, la courbe de Phillips, qui prédit une relation négative entre ces deux variables, naît de l'idée qu'en cas de forte croissance économique, anticipant une pression à la hausse sur les prix, la banque centrale domestique devrait mettre en place une politique plutôt restrictive ce qui impliquerait un ralentissement de l'économie, avec une montée induite du chômage. Le décideur politique se retrouve donc

face à un arbitrage inflation-chômage.

Si un pays importe la politique monétaire de la BCE, celle-ci ne répond pas forcément à l'état de sa propre économie et nous pourrions alors observer une déconnexion entre ces variables, i.e. une courbe de Phillips relativement plate.

Pendant une décennie, les taux de chômage et d'inflation, dans les PECO, ont tendance à converger vers un niveau bas. La transition des PECO, vers les économies de marché, a d'abord été frappée par d'énormes pressions sur l'inflation et le chômage. Un quart de siècle plus tard, les taux d'inflation semblent maîtrisés. Cependant, la reprise économique relativement forte, observée dans les PECO, ces dernières années, après la crise économique et de la dette souveraine, devrait conduire à des pressions inflationnistes.

Dans le même temps, certains des PECO, à savoir les États baltes, la Slovénie et la Slovaquie, sont entrés dans la zone Euro. Ils passent de régimes de change différents à la perte de leur autonomie monétaire. Dans le contexte de l'UE, on se demande si l'on observe une courbe de Phillips significative, dans les pays périphériques. Alors que la politique monétaire de la BCE réagit au marché du travail de la zone monétaire, l'adhésion à l'Euro représente-t-elle un choc qui pourrait expliquer le changement potentiel des comportements dans la relation inflation-chômage ?

Revue de la littérature

Dans le débat, autour des comportements inflationnistes, au lendemain de la crise de 2008, la littérature met en exergue l'absence de courbe de Phillips, les variations d'inflation étant faibles par rapport à ce qui était réellement attendu (Blanchard et al., 2015 ; Blanchard, 2016 ; Ciccarelli & Osbat, 2017). Parmi les multiples solutions proposées pour faire face à ce phénomène, Ball & Mazumder, (2019) et Barnichon & Mesters (2020b) concluent que l'ancrage des anticipations d'inflation est un moteur important pour expliquer la nouvelle relation qui existe entre l'inflation et le chômage. D'un autre côté, D'Adamo & Rovelli, (2015), Bell & Blanchflower (2018),Byrne & Zekaite (2020) et Del Negro et al. (2020) soulignent que les institutions du marché du travail permettent également d'expliquer en grande partie les phénomènes observés.

Modèle

La littérature sur la courbe de Phillips met récemment en évidence le problème d'identification et pose la question du comportement inflationniste (Mavroeidis et al., 2014 ; Barnichon et Mesters, 2020a, b ; McLeay et Tenreyro, 2020). Dans un cadre de politique monétaire optimal,

McLeay et Tenreyro (2020) décrivent, à l'équilibre, le processus d'inflation apparemment exogène (c'est-à-dire déconnecté de l'écart de production). Les pressions inflationnistes, résultant d'un écart de production indésirable, sont évitées par une politique monétaire optimale.

Pour se débarrasser de ce problème d'identification de la courbe de Phillips, des données désagrégées ont prouvé leur efficacité. Selon McLeay et Tenreyro (2020), le biais simultané est en partie résolu, en utilisant des données au niveau régional. La dimension régionale permet à tout écart d'inflation ou de production, au niveau agrégé, de dépendre de la moyenne pondérée de l'ensemble des régions. De plus, chaque région est dotée de sa propre courbe de Phillips et souffre de chocs idiosyncratiques, avec des retombées possibles, entre les régions (les termes d'erreur peuvent être corrélés entre les régions). Il est évident que, dans un tel cadre, il y a une seule réponse de la politique monétaire à l'écart moyen pondéré.

Même en cas de réponse optimale de la politique monétaire, à une déviation globale, le décideur ne tient pas compte de la déviation régionale idiosyncratique, de sorte que la courbe de Phillips régionale souffre d'un choc de demande exogène qui ne modifiera pas la courbe agrégée.

Stratégie empirique

Nous estimons la forme réduite de base de la NKPC, d'après Gali et Gertler (1999), Cogley et Sbordone (2008) et plus récemment McLeay et Tenreyro (2020). Nous nous concentrons sur un panel d'économies de l'Union européenne et dérivons des hétérogénéités nationales. L'Union européenne offre en effet un cadre intéressant. En tant qu'union monétaire, la zone euro nous permet de traiter une estimation multi-pays, de la courbe de Phillips, où chaque pays de la zone est traité comme une seule région.

Pour relier la spécification régionale, de McLeay et Tenreyro (2020), au processus d'adhésion à la monnaie unique, nous utilisons le cas spécifique des pays baltes, à savoir l'Estonie, la Lettonie et la Lituanie, plus la Slovénie et la Slovaquie. Ce groupe de cinq pays présente des particularités spécifiques. Au cours de la période 2000-2020, ils ont rejoint l'Union européenne, sont passés par le mécanisme de taux de change (MCE-II) et sont effectivement entrés dans la zone euro. Nous nous attendons à ce que ces changements monétaires aient un impact potentiel sur la relation empirique entre l'inflation et le chômage. L'introduction d'un groupe de pays, qui ne fait pas partie de la zone Euro, dans un premier temps, a du sens, car le MCE-bis impose un contrôle monétaire drastique. De cette manière, nous renvoyons aux travaux récents de Jorda et al. (2018) et le trilemme de la finance internationale.

L'approche dérivée de McLeay et Tenreyro (2020), contient certaines limites empiriques. La première réside dans la mesure de l'inflation attendue. En effet, les auteurs redoutent une don-

née moins précise, au niveau régional. Cependant, nous contournons ce problème, en utilisant des données au niveau des pays et en envisageant une approche multi-pays. Le deuxième problème réside dans la variabilité inter-régionale, qui trop faible, pourrait empêcher la stratégie d'identification. Dans le contexte européen, le pouvoir discrétionnaire de la politique budgétaire appartient à chaque État membre. Nous attendons des comportements différents de la part des décideurs et du marché du travail après un choc. Les réactions hétérogènes, suite au ralentissement économique de 2008, confirment que nous fournissons un contexte suffisamment hétérogène. De plus, tout écart permanent est capturé par l'introduction d'effets fixes individuels. Les hétérogénéités régionales invariantes du chômage ou de l'inflation anticipée illustrent les écarts transversaux qui doivent être capturés, avant d'estimer le modèle. Le problème de la réponse endogène, de la politique monétaire, aux chocs globaux est résolu via l'introduction d'effet fixes temporels.

Données et statistiques préliminaires

Suivant la littérature, comme dans Ball and Mazumder (2011, 2019) ou Coibion et al. (2018) et McLeay et Tenreyro (2020), notre variable dépendante fait référence à l'inflation sous-jacente, c'est-à-dire que nous considérons l'indice des prix à la consommation harmonisé (IPCH), hors énergie et produits alimentaires. Les enquêtes sur les anticipations d'inflation sont devenues un moyen habituel, pour considérer le rôle de l'ancrage des anticipations, dans la courbe de Phillips (Albuquerque et Baumann, 2017; Ball et Mazumder, 2019). Nous utilisons des données d'enquêtes auprès des consommateurs. Les données, de la Commission européenne, couvrent la période 1985-2020, à une fréquence trimestrielle. Pour mesurer les ralentissements économiques, tels que définis dans les évolutions de la courbe de Phillips, nous utilisons des données sur le taux de chômage, extraites de la base de données de l'OCDE. Nous utilisons des données trimestrielles désaisonnalisées, disponibles de 1983 à 2019. Pour calculer l'écart de chômage, nous considérons un filtre de Hodrick-Prescott, comme Jašová et al. (2020).

Dans notre panel, le taux d'inflation varie de 5,73 à 13,66%, en variation annuelle, à une fréquence trimestrielle. Les valeurs les plus élevées sont observées en Estonie et en Lettonie, ce qui suggère une volatilité plus élevée du taux d'inflation. Si l'on examine les données sur le chômage, les valeurs les plus élevées du taux de chômage sont observées en Espagne, après le ralentissement économique de 2008. Les écarts de chômage sont relativement importants en Estonie et en Lettonie. Plus précisément, l'écart de chômage est fortement négatif sur la période 2007-2008 mais positif après le ralentissement économique de 2008 (2009-2010) dans ces deux pays. Dans les deux cas, cela correspond à des réactions opposées du taux d'inflation. Il existe une corrélation négative globale entre le taux d'inflation et l'écart de chômage (-0,34)

et positive entre l'inflation et l'inflation anticipée.

Résultats

Dans nos premières estimations, nous trouvons un coefficient de courbe de Phillips négatif significatif, conformément à la littérature. La comparaison entre les PECO et le reste de l'UE ne permet pas de conclure sur une courbe de Phillips plus abrupte dans les PECO, comme le montre Jarocinski (2010). Le coefficient de l'écart de chômage semble être relativement stable parmi les différentes estimations. Comme prévu, l'inflation anticipée et la persistance de l'inflation ont un impact significatif sur la variable dépendante, ce qui corrobore Ball et Mazumder (2019).

À partir de là, nous voulons déterminer si les changements, selon le statut à l'intérieur de l'UE, ont un impact sur la relation entre l'inflation et le chômage. Nous observons une relation relativement stable sur l'inflation anticipée, comme c'est le cas pour le coefficient d'écart du chômage. Cependant, le coefficient de pente de la courbe de Phillips n'est plus significatif après l'entrée des PECO dans la zone Euro (résultat robuste à différentes alternatives testées). Dans l'hypothèse où les petites économies ouvertes n'impactent que marginalement la politique monétaire de la zone euro, on s'attend à trouver un coefficient de courbe de Phillips significatif, en regardant les leaders économiques de la zone Euro. Nous nous concentrons sur les six premiers membres de l'UE, à savoir la Belgique, la France, l'Allemagne, l'Italie, le Luxembourg et les Pays-Bas. Nous trouvons un coefficient de courbe de Phillips toujours significatif, proche de ce qui a été trouvé dans les résultats précédents.

Nos résultats précédents indiquent implicitement que les petites économies ouvertes, dans une union monétaire, sans contrepartie budgétaire, s'appuieront fortement sur des outils budgétaires et fiscaux pour stimuler leur économie. Ces résultats tendent à corroborer Del Negro et al. (2020) sur le rôle accru des institutions du marché du travail.

Chapitre 4

Si pour être pleinement efficace, la politique unique de la BCE doit se confronter, à des économies relativement homogènes, cette homogénéité transcende la sphère monétaire et touche directement l'économie réelle (en témoigne la courbe de Phillips). Les mécanismes d'ajustements, dans une union optimale, permettent de lisser l'impact des chocs asymétriques. Pour cela, le marché du travail nécessite une flexibilité (des salaires) et une mobilité des facteurs de production accrue. Ceci est rendu nécessaire par l'absence de l'instrument du taux de change, qui, en régime flexible, vient soutenir les mécanismes d'ajustements non-monétaires.

L'espace Schengen illustre parfaitement cette volonté de promouvoir la flexibilité du marché du travail, en permettant une mobilité renforcée. Cependant, les récentes données Eurostat montrent une hétérogénéité dans les flux migratoires au sein de l'union et un faible impact sur la réduction du taux de pauvreté.

La stratégie de croissance Europe 2020 vise une meilleure coordination des politiques nationales dans l'Union européenne. Fixé pour une période de dix ans en 2010, l'un des cinq principaux piliers indique une augmentation de six points de pourcentage (pp) du taux d'emploi de la population âgée de 20 à 64 ans (de 69% à 75%). Au cours de la période 2010-2018, le taux d'emploi a augmenté en moyenne dans l'UE-28, à 73,1%. La variation a été particulièrement impressionnante dans les PECO, où elle passe de 65,5% à 74,3%. En comparaison, il a augmenté de moins de 3,5 points de pourcentage (pp) dans le groupe EU-15. Alors que le niveau d'emploi augmente de 5% dans les deux groupes de pays, le dénominateur du taux d'emploi, la population en âge de travailler, est resté stable dans le groupe de l'UE-15 et a diminué de 6% dans les PECO. De ce point de vue, l'évolution du taux d'emploi dans les PECO semble être relativement plus reliée à l'offre de main-d'œuvre.

C'est dans ce contexte spécifique que nous trouvons intéressant de regarder les dynamiques sur les marchés du travail dans les PECO et de faire une comparaison avec les économies de l'UE-15. L'objectif de ce chapitre est de démêler les mécanismes du marché du travail, lorsqu'un choc exogène affecte le niveau de l'emploi. Nous revisitons le modèle Blanchard et al. (1992) et observons comment une innovation en matière d'emploi est absorbée sur le marché du travail. En nous concentrant sur les taux d'emploi, de chômage et de participation, nous nous attendons à ce qu'une innovation positive sur la demande de main-d'œuvre stimule temporairement le taux de participation et diminue le taux de chômage, aboutissant à un niveau d'emploi permanent plus élevé.

Revue de la littérature

Le processus de transition dans les PECO a commencé dans les années 90 et impliquait un nouveau chômage induit par des restructurations, des privatisations et une substitution travail/capital (Aghion et Blanchard, 1994 ; Blanchard, 1998). L'efficacité des institutions du marché du travail est souvent pointée du doigt pour justifier la faiblesse des ajustements et l'augmentation des disparités régionales (Rutkowski, 2006 ; Bornhorst et Commander, 2006 ; Münich et Svejnar, 2007 ; Jurajda et Terrell, 2009). Les disparités régionales s'accroissent entre les centres économiques et les régions en retard, souvent plutôt rurales (Svejnar, 1999 ; Gacs et Huber, 2005 ; Huber, 2007)

Résumé

Données

Cette étude considère une approche régionale au niveau européen (28 pays). Deux groupes de pays sont analysés. Nous utilisons le groupe EU-15 comme référence, face aux PECO, pour permettre une comparaison au sein de l'UE-28. Nous adoptons l'utilisation des données NUTS-2, couramment utilisées pour analyser la dynamique du marché du travail de l'UE (Decressin et Fatás, 1995 ; Gacs et Huber, 2005 ; Halleck Vega et Elhorst, 2014 ; Beyer et Smets, 2015). Les données de population en âge de travailler, d'emploi et de chômage sont extraites d'Eurostat et couvrent la période 1999-2017.

Le taux d'emploi dans les PECO est proche mais inférieur au niveau de l'UE-15. Cependant, de 2010 à 2017, le taux d'emploi atteint 91,66% de la population en âge de travailler, 0,5 pp de plus que dans le groupe EU-15. Dans les PECO, la République Tchèque est la plus performante avec le taux d'emploi le plus élevé (94,12%) et le taux de chômage le plus bas (5,88%). Malgré une tendance à la hausse, le taux de participation dans les PECO reste inférieur au niveau de l'UE-15. Comme souligné dans EC (2018), les évolutions positives des variables du marché du travail, dans les PECO, cachent un écart difficile à combler entre les genres. La participation des femmes au marché du travail reste un problème d'actualité. Malgré une augmentation du taux d'emploi des femmes et une baisse du taux de chômage, l'écart entre les genres en matière de participation a augmenté de près de 7,5 points, à un niveau plus élevé que dans l'UE-15.

Stratégie empirique

Le principal avantage de l'analyse de Blanchard et al. (1992) est de donner un aperçu des différents comportements sur le marché du travail du côté de l'offre et de la demande. De plus il permet de visualiser la part d'un choc d'emploi, absorbée à long terme, par les salaires ou par le chômage. La simulation d'une innovation exogène d'emploi illustre facilement la réaction du niveau d'emploi et des taux de participation et de chômage. Pour saisir la dynamique du marché du travail et traiter l'endogénéité entre les variables de l'emploi, du chômage et de la participation, nous utilisons un panel VAR avec un estimateur en GMM, plus approprié aux rapports de dimension dans notre panel. Notre modèle VAR réduit intègre trois variables endogènes, le taux de croissance de l'emploi, le taux d'emploi et le taux de participation.

Comme nous voulons comprendre la dynamique régionale des variables du marché du travail, nous devons séparer la partie régionale de chaque variable, de la contrepartie nationale. Pour ce faire, nous utilisons l'estimateur CCEMG de Pesaran (2006). Le résidu de l'estimateur CCEMG est assimilé à la partie spécifique régionale de la variable. Selon le théorème de Frisch-Waugh, l'utilisation de variables décalées, évite l'introduction de l'effet fixe temporel,

qui aurait alourdi notre spécification (Blanchard et al., 1992 ; d'Albis et al., 2018).

Via les fonctions de réponse, nous retraçons les impacts d'un choc emploi, sur l'emploi, le taux d'emploi et le taux d'activité. En orthogonalisant la réponse, nous pouvons identifier l'effet d'un choc au temps zéro sur une variable précise, tout en maintenant les autres constantes. Conformément à la littérature, nous ordonnons d'abord le taux de croissance de l'emploi, de sorte qu'il influe simultanément sur le taux de croissance de l'emploi lui-même, le taux d'emploi et le taux d'activité.

Résultats

À la suite du pic initial de l'emploi, la variable décroît lentement, atteignant un nouveau plateau correspondant à un niveau d'emploi permanent plus élevé, autour d'une augmentation à long terme de deux points de pourcentage (pp). Après une simulation de quinze périodes, le plateau atteint par l'emploi représente 80% de l'impact initial (2,2pp contre 2,7pp).

Nous prévoyons une réaction temporaire, négative, du taux de chômage tandis que le taux de participation devrait augmenter. Les résultats sont cohérents avec ces prévisions et montrent une baisse de 0,2 pp du chômage et une augmentation de 0,3 pp du taux de participation. A moyen-long terme (soit jusqu'à 15 ans de projection), le choc sur l'emploi explique environ 8% de la variance du taux de chômage alors qu'il explique 15% de la variance du taux de participation.

Une sensibilité plus forte, observée dans le groupe de l'UE-15 reflète un niveau d'interconnexion relativement plus élevé entre les variables sur le marché du travail. Comme nous avons observé une baisse globale des taux de chômage dans les PECO au cours de la dernière décennie mais des disparités croissantes, nous réexaminons l'hétérogénéité régionale de Gacs et Huber (2005). Sans surprise, la persistance du choc de l'emploi est relativement plus faible dans les régions avec une part élevée de l'emploi dans le secteur de la haute technologie.

Discussion

Suite à une innovation négative sur la demande de main-d'œuvre, un changement d'emploi induit une variation des salaires et du chômage à long terme. Un choc négatif sur l'emploi entraîne une baisse des salaires qui implique la migration des entreprises, entraînant une nouvelle création d'emplois. D'un autre côté, des salaires relatifs plus faibles et un chômage supérieur à la moyenne induisent une émigration nette des travailleurs à mesure que le coût d'opportunité de la migration diminue.

L'adhésion à l'UE, en 2004 pour la plupart des PECO et en 2007 pour la Roumanie et la Bulgarie

Résumé

(2013 pour la Croatie), a conduit à des flux migratoires Est-Ouest qui corroborent ces faits. La corrélation entre le taux de croissance de l'emploi et le taux de croissance naturelle de la population est faible (0,054). Cependant, avant de raccrocher nos résultats à un mécanisme migratoire, il nous faut d'abord démêler dans quelle mesure l'emploi à temps partiel et l'évolution du nombre d'heures travaillées jouent un rôle dans l'évolution de l'emploi. Nous montrons une importance relativement faible de l'emploi à temps partiel dans le comportement de l'emploi de sorte que nous ignorons ce canal et rejetons le canal du travail informel par manque de données disponibles (retirer de notre panel les pays avec des niveaux de travail informel suspecté relativement fort, ne vient pas changer nos résultats)

Lorsque les salaires augmentent, suite à un choc exogène positif sur l'emploi, certaines entreprises peuvent réduire leur niveau d'emploi. Ce mécanisme, associé à l'immigration de travailleurs, minimise l'impact positif sur l'emploi et justifie en partie le retour du taux de chômage à sa trajectoire de long terme. D'après nos résultats, ce processus a besoin de plus de temps dans les PECO par rapport à l'UE-15. Du point de vue de l'offre de main-d'œuvre, les flux migratoires, suite à l'évolution positive des salaires et à la baisse du chômage, ramènent le taux d'activité à son niveau de long terme. Dans les deux groupes de pays, les hausses de participation observées s'estompent rapidement, suggérant une augmentation de la flexibilité, par rapport à la littérature antérieure. Les comportements de la population active semblent similaires dans les deux groupes de pays. Nous corroborons Beyer et Smets (2015) qui ont mis en évidence une augmentation de la flexibilité géographique de l'offre de main-d'œuvre en Europe de l'Ouest par rapport aux études précédentes (Decressin et Fatás, 1995). Contrairement à Gacs et Huber (2005) et Fidrmuc (2004), qui n'ont trouvé aucun canal de mobilité interrégionale significatif de la main-d'œuvre, dans les PECO, nos résultats montrent un rôle croissant de la migration.

Après une projection sur quinze périodes, le niveau d'emploi reste aux quatre cinquièmes du choc initial dans les PECO contre les trois quarts dans le groupe EU-15. L'impact à long terme relativement plus élevé dans les PECO tend à mettre en évidence un canal de chômage relativement plus fort. Le canal du salaire plus faible, indique que la majeure partie de l'ajustement se fera par l'offre de main-d'œuvre.

L'augmentation de la mobilité de la main-d'œuvre, à la suite de Gacs et Huber (2005), a été une politique clé pour résoudre les problèmes de chômage élevé, rencontrés dans certaines régions, au cours de la première décennie de la transition.

Bien que nous ayons trouvé des résultats plus significatifs et plus robustes que par le passé, le canal salarial semble rester relativement faible, ce qui suggère un développement difficile de la mobilité. Cela est particulièrement vrai dans les régions relativement plus pauvres (taux de risque de pauvreté élevé) ou dans les régions plus rurales. Sans stratégie spécifique tournée

vers ces régions, pour accroître leur attractivité et leur résilience, le risque de trappe à pauvreté régionale, sans retombées des centres économiques vers les régions en retard augmente. Pour augmenter l'élasticité des salaires, comme dans les régions plus tournées vers les secteurs de haute technologie, les décideurs politiques peuvent se concentrer sur l'attractivité régionale (c'est-à-dire l'investissement direct étranger) et sur la qualité de l'offre de main-d'œuvre.

L'approche que nous avons utilisée ne donne aucune information sur la distinction entre mobilité intra-pays et migration internationale. Ce point est particulièrement difficile dans le cas du développement de l'UE. Les politiques macroéconomiques, tournées vers la mobilité de la main-d'œuvre, pourraient induire une augmentation des disparités régionales induisant des phénomènes tels que la «fuite des cerveaux» au niveau européen. La manière dont la politique du travail est élaborée dans les PECO est particulièrement importante, compte tenu de l'impact potentiel de long terme, relativement plus élevé.

Au regard des questions de genre, nous avons trouvé une élasticité salariale plus élevée dans les régions où le taux d'activité des femmes est relativement plus élevé. Cela suggère que l'augmentation du taux de pénétration des femmes sur le marché du travail conduit à un marché du travail plus efficace. Nous avons également constaté, dans une moindre mesure, qu'en cas de choc négatif sur l'emploi, la participation des femmes au marché du travail a tendance à réagir de manière excessive par rapport à la participation des hommes. Pour accroître la participation des femmes et réduire la vulnérabilité de cette frange de la population, de récents rapports du FMI et des pays européens soulignent la nécessité de développer le taux de pénétration des femmes et d'investir dans des programmes de la petite enfance. En effet, en moyenne dans le groupe de l'UE-15, 30 à 35% des enfants de moins de 3 ans sont engagés dans un programme de garde d'enfants. Concernant les PECO, ce taux tombe en moyenne en dessous de 15% (par exemple, en 2016, le ratio en Bulgarie 12,8%, République tchèque 4,7%, Hongrie 15,6%, Pologne 7,8%, Roumanie 17,4%).

Chapitre 5

Pour apporter une réponse institutionnelle, aux dysfonctionnements du marché du travail, que nous venons de mettre en lumière, il apparait évident, de voir la flexibilité de l'offre de travail, comme un mécanisme d'ajustement performant. Cette flexibilité se définit au sens de la mobilité inter-régionale, mais également via la mobilité intersectorielle. Accroître la mobilité intersectorielle est possible via la formation, l'éducation. Inscrit dans la stratégie UE-2020, l'augmentation du niveau d'éducation de la population est un pilier des politiques européennes, cependant que des disparités significatives perdurent entre les pays. Ces objectifs s'inscrivent fondamentalement dans l'idée de promouvoir une croissance intelligente,

soutenable et inclusive.

Un des objectifs visés par l'UE-2020 consiste à assurer que 40% de la population, âgée de 30-34 ans, ait un niveau d'éducation équivalent tertiaire. Un tel objectif est supporté par l'idée que l'investissement dans l'éducation tertiaire est corrélé avec le rôle du capital humain dans la croissance économique. A long terme, la Commission Européenne suggère un impact positif sur les taux de croissance économique, d'une population active plus éduquée, amenant également une meilleure efficience dans l'appariement entre l'offre et la demande sur le marché du travail.

En ce qui concerne les PECO, quatre pays, à savoir la Bulgarie, la Croatie, la Hongrie et la Roumanie, n'atteignent pas leur objectif tandis que d'autres, comme les États baltes ou même la Pologne font partie des pays les plus performants. Dans le contexte de convergence de l'UE, on peut se demander si un tel objectif était utile à la fois pour augmenter le niveau de capital humain et pour générer une croissance économique plus intelligente. Dans la littérature sur la théorie de la croissance et plus particulièrement au regard du rôle du gouvernement, nous essayons de comprendre l'impact de l'augmentation du capital humain, sur la croissance économique. L'objectif principal de cet article est de clarifier les interactions, entre le développement économique et les dépenses publiques d'éducation, en partant du principe que pour augmenter le capital humain, le financement de l'éducation peut être déterminant.

Revue de la littérature

L'impact du capital humain dans la croissance économique met en évidence le double rôle de l'éducation comme un vecteur d'augmentation du capital humain, augmentant également les flux internationaux de connaissance, stimulant l'innovation (Benhabib et Spiegel, 2005 ; Valero et Van Reenen, 2019). Avec la problématique de l'éducation, vient inéluctablement la question de son financement (Cashin, 1995 ; Kneller et al., 1999 ; (Acemoglu et al., 2006 ; Zhang et Zhuang, 2011 ; Agénor et Canuto, 2015). Le financement de l'éducation, en particulier par les dépenses publiques, peut atténuer l'impact économique à long terme de l'augmentation du capital humain (Glomm et Ravikumar, 1992 ; Kaganovich et Zilcha, 1999 ; Dissou et al., 2016). Les résultats semblent converger vers l'idée d'un impact positif sur la croissance, des dépenses publiques d'éducation (Bose et al., 2007 ; Afonso et Jalles, 2014 ; Gemmell et al.,2016). Néanmoins des considérations de substitution publique-privée (Gamlath et Lahiri, 2018) et de composition de la dépense remettent en perspective ces résultats (Aghion et al., 2009 ; Arcalean et Schiopu, 2010).

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Approche empirique

D'après le modèle de Blankenau et al. (2007), nous estimons une équation de croissance qui lie le PIB aux dépenses publiques d'éducation, incluant également les dépenses publiques globales, minorées du volet éducation, le stock de capital humain et une variable de fiscalité. Comme dans Blankenau et al. (2007), nous utilisons les indicateurs du développement de la Banque mondiale. Nous nous concentrons sur la période 1990-2018. Bien qu'intéressé par le contexte européen, notre approche empirique, pour une raison évidente d'obtenir des résultats plus robustes, s'appuie sur un échantillon mondial.

Pour réduire le biais d'hétérogénéité du panel, nous limitons notre panel, aux pays à revenu intermédiaire de la tranche supérieure et aux pays à revenu élevé tels que définis par la Banque mondiale. Sur l'ensemble de la période, la consommation finale des administrations publiques (hors éducation) est de 4pp. plus élevée dans les pays à revenu élevé avec des ratios stables dans le temps. La part des dépenses d'éducation dans les dépenses totales du gouvernement est de deux pp. plus élevée dans les pays à revenu intermédiaire de la tranche supérieure, ce qui suggère une stratégie publique plus forte en faveur de l'éducation dans ce groupe.

Notre variable fiscale, à l'instar de Blankenau et al. (2007), contrôle l'importance de l'effet d'éviction du financement des dépenses publiques. Notre dernière variable concerne la mesure du stock de capital humain. La scolarisation souffre d'une forte inertie, se rapprochant d'un niveau stable. Cela est particulièrement vrai dans les pays à revenu élevé. La littérature plus récente se concentre sur le niveau de scolarité (Barro, 2001 ; Faggian et McCann, 2019 ; Neycheva, 2019) ou sur les années de scolarité à la Barro et Lee (2013). Dans les pays à revenu intermédiaire de la tranche supérieure, de 2010 aux dernières données disponibles, le niveau de l'enseignement supérieur représente en moyenne 20% de la population alors que ce ratio grimpe à 33% dans les pays à revenu élevé. Selon Barro et Lee (2013), en 2010, en moyenne, le nombre d'années de scolarisation, dans les économies moyennes supérieures, restent en deçà des revenus élevés (respectivement 8,5 et 10,7 années) ; l'enseignement supérieur achevé est moitié moins élevé dans le premier groupe tandis que la part de la population sans instruction est deux fois plus élevée.

Ces variables considèrent implicitement un niveau homogène de qualité de l'éducation entre les pays. Une telle hypothèse a été en partie abordée par Hanushek et Woessmann (2020) avec un écart croissant entre la qualité de l'éducation et la quantité de l'éducation. Nous renvoyons donc à un travail récent de Lim et al. (2018), utilisant à la fois l'éducation et la santé pour appréhender le niveau de capital humain. Ils construisent un indice annuel pour 195 pays de 1990 à 2016 à l'aide d'enquêtes sur les recensements, la santé, l'apprentissage et les ménages provenant de sources multiples. Cette approche globalisante permet de s'affranchir de nombreux enjeux concernant les mesures du capital humain. Les valeurs les plus basses

sont observées dans les économies à revenu moyen supérieur telles que la Guinée équatoriale, la Namibie et le Botswana. La Finlande, l'Islande, le Danemark et les Pays-Bas sont les mieux classés.

Toutes les variables du modèle sont exprimées via leur logarithme, par période de cinq ans pour contrôler pour le cycle économique. Nous utilisons un estimateur LSDV avec correction, adapté au panel dynamique autorégressif.

Résultats

Au regard du panel complet, la variable dépendante retardée a un coefficient positif et très significatif, inférieur à l'unité, qui résume l'hypothèse de convergence de l'équation de croissance. Comme le suggère notre modèle économique, les dépenses publiques ont un impact positif sur le PIB, tout comme les dépenses d'éducation. Notre coefficient attaché aux dépenses publiques d'éducation est légèrement inférieur à ce que nous observons dans la littérature. En nous concentrant uniquement sur les pays de la tranche haute des moyens revenus, l'impact positif des dépenses publiques n'est pas significatif (ce résultat est robuste à une série d'estimations alternatives).

Dans le modèle de Blankenau et al. (2007), l'agent est doté d'une dépense d'éducation publique et du capital humain de la génération précédente pour expliquer l'accumulation de capital humain. L'absence d'impact significatif dans les économies à revenu moyen supérieur, après avoir examiné le contrepoids fiscal, suggère que le problème peut résider dans la formation de capital humain (i.e., la capacité de la dépense publique à générer du capital humain). Pour capturer cette efficacité des dépenses publiques d'éducation, nous utilisons la technique d'analyse d'enveloppement des données (DEA) de Ji et Lee (2010), pour générer une nouvelle variable, que nous utilisons comme un poids sur la dépense publique d'éducation. Nous obtenons une nouvelle variable, qui ordonne chaque observation pays-année que nous introduisons comme une interactive avec la dépense publique d'éducation. Le coefficient attaché à la variable interactive n'est pas significatif, de sorte que nous ne pouvons pas affirmer que l'inclusion de l'efficience améliore la prédiction de l'impact de la dépense publique d'éducation sur la croissance. Nous avons alors divisé notre échantillon de pays en deux nouveaux sous-groupes. Les pays dont le niveau d'efficacité des dépenses publiques, en 2010, est inférieur à la médiane, sont considérés comme des pays inefficaces ; efficace par ailleurs. Alors que dans le groupe inefficace, tout coefficient, attaché aux dépenses publiques, est non-significatif ; dans le groupe efficient, les dépenses publiques sont positives et significatives. De plus, l'effet marginal a fortement augmenté, par rapport à l'estimation précédente suggérant un rôle important de l'efficience dans les dépenses publiques pour comprendre leur rôle sur le

PIB. Une augmentation de 1% des dépenses publiques d'éducation, augmente le PIB réel par habitant de 0,2% (deux fois plus élevé que dans la régression principale et qui se rapproche des précédents résultats trouvés dans la littérature).

Nous examinons plus en détail la différence entre les groupes, en fonction de leurs revenus et en fonction de l'efficacité. Nous observons que les pays, appartenant au groupe à revenu moyen supérieur mais qui sont dans le groupe efficace, sont principalement des pays d'Europe centrale et orientale. Notre stratégie d'efficacité est robuste au changement de l'estimateur de première étape ou à une autre mesure du capital humain. Ces résultats révèlent l'importance d'avoir une dépense éducative en cohérence avec une augmentation effective du capital humain.

Conclusion

Alors que la Bulgarie et la Croatie sont entrées dans le MCE-II, au cours de l'été 2020, le développement de l'Union européenne, depuis sa création, il y a plus d'un demi-siècle, semble entrer dans un processus auto-entretenu. Cependant, des défis économiques, des progrès sociaux et sociétaux se posent continuellement. Dans l'histoire des élargissements de l'UE, les PECO servent de cas d'étude. Ils sont passés par une métamorphose profonde, où l'économie de marché fait la part belle à la planification centrale.

Pour comprendre le cadre économique dans lequel s'inscrit notre travail, le chapitre 1 détaille comment l'amélioration du bien-être a conduit les pays à accroître le commerce international. Des échanges commerciaux aux unions monétaires, le cas particulier des PECO illustre les défis, poussant les économies en transition vers la convergence.

Le chapitre 2 intègre la discussion actuelle sur les développements de la zone Euro avec l'intégration financière et monétaire internationale. Nous nous penchons sur la position spécifique des six derniers pays, membres de l'UE mais à la limite de l'Euro. L'objectif principal est d'appréhender les retombées monétaires, de la BCE, vers d'autres économies. Compte tenu de leur niveau élevé d'intégration multidimensionnelle, nous avons constaté comme attendu, des retombées significatives.

Le chapitre 3 est une réponse à l'efficience sous-jacente de la politique monétaire intérieure. La courbe de Phillips décrit la relation négative entre le taux d'inflation et le chômage, comme un fait stylisé pour corroborer l'efficacité de la Banque centrale. Nous nous demandons si le processus d'intégration européen produit un choc exogène, sur la mise en œuvre de la politique monétaire intérieure. Nous nous concentrons sur les États baltes, la Slovénie et la Slovaquie, car ces pays au cours des vingt dernières années sont passés par l'adhésion à l'UE et le MCE-II pour finalement adopter l'Euro comme monnaie. Jusqu'à ce qu'ils entrent dans

l'union monétaire, nous retrouvons une relation significative, cohérente avec l'autonomie monétaire. Cependant, une fois que l'euro, en tant que monnaie, est adopté, l'abandon de l'autonomie monétaire induit un applanissement de la courbe de Phillips. Nous associons ce résultat au fait que, dans l'union monétaire, les économies relativement plus petites ne sont pas assez fortes pour influencer la politique monétaire unique.

Le chapitre 4 s'éloigne légèrement des questions monétaires, dessinées dans les deux chapitres précédents et se concentre sur le marché du travail abordé via le chômage au chapitre 3. Jusqu'à présent, nous avons mis en évidence certains problèmes monétaires et leurs effets ultérieurs sur l'économie réelle (chapitre 2) et sur le taux de chômage (chapitre 3). Dans le contexte d'une union monétaire, la question du choc asymétrique devient cruciale. Dans l'UE, le coût de la migration (barrières sociales, linguistiques) reste relativement élevé. La mobilité de la main-d'œuvre pouvant être un facteur important pour expliquer la dynamique du marché du travail, nous essayons de comprendre les ajustements du marché du travail, au niveau régional NUTS-II. L'objectif principal du chapitre 4 est de démêler les comportements hétérogènes régionaux à la suite d'un choc sur l'emploi.

Par rapport à la littérature précédente, nous trouvons un canal de chômage plus robuste que les salaires. La réponse au chômage prend plus de temps pour revenir à sa tendance de long terme, dans les PECO. En quittant la dichotomie UE-15 contre PECO, nous trouvons une résilience plus faible dans les régions plus pauvres et une sur-réaction de la participation des femmes. Pour favoriser la flexibilité de l'offre de main-d'œuvre et éviter la persistance d'un choc négatif sur l'emploi, une solution consiste à préparer l'offre de main-d'œuvre à entrer sur le marché du travail et à s'adapter rapidement à l'évolution de la demande.

Le chapitre 5 tente d'apporter des réponses à la tension du marché du travail décrite au chapitre 4. Pour permettre une meilleure absorption des chocs, nous postulons que l'offre de main-d'œuvre devrait accroître sa flexibilité. Pour atteindre un tel objectif, nous nous concentrons sur le rôle du capital humain. La théorie économique met en lumière l'importance, du capital humain, pour expliquer la croissance économique. Cependant, le financement de l'accumulation de capital humain peut décourager l'impact positif sur la croissance. Une fois que nous introduisons une mesure d'efficacité, dans la dépense publique, nous restituons les résultats prédits par la théorie du capital humain. Un tel résultat apparaît dans les pays avec un niveau d'efficacité relativement élevé. Le principal objectif de l'éducation, dans la théorie de la croissance, est d'augmenter le capital humain. Une stratégie cohérente, pour offrir une éducation en adéquation avec la demande de main-d'œuvre, devrait aboutir à une diminution de l'inadéquation et/ou de l'inefficacité de la main-d'œuvre sur le marché du travail.

Développements futurs

Deux axes principaux de recherche future s'ouvrent au regard de notre thèse. Tout d'abord, en reprenant les chapitre 2 & 3, nous n'avons pas abordé le volet du développement bancaire et financier. Dans l'introduction, nous avons fait brièvement mention du système bancaire des PECO, hétérogène et globalement très lié à celui des pays européens. Il semblerait intéressant d'analyser l'impact des régulations bancaires, mises en place sur le système bancaire européen, durant la dernière décennie, en réponse aux différents chocs, sur le financement de l'économie des PECO, leur rôle sur le canal du crédit de la politique monétaire domestique, le développement du crédit et la réaction du système financier.

En parallèle, mais non déconnecté des sphères monétaire et financière, en réponse aux chapitres 3 & 4, résolument orientés vers le fonctionnement du marché du travail et son pendant, l'éducation, il semble intéressant d'examiner l'attractivité des territoires. Les Politiques Actives du Marché du Travail répondent à ce double enjeu d'attractivité territoriales, via les flux de capitaux d'un côté et l'amélioration de l'accès au marché du travail par la formation, de l'autre. Ce dernier cheminement force à remettre le marché du travail dans le prisme d'un marché commun d'Europe et dans la question d'un développement de la politique budgétaire européenne, avec l'afférente abondante littérature.

En conclusion du propos

Nous mentionons, dans l'introduction, que les questions politiques vont au-delà de la simple intégration économique. Chaque État membre de l'UE-28, en tant qu'entité singulière, contribue au développement économique, de l'union, dans un jeu politique sans précédent.

L'introduction de l'Euro, en tant que monnaie unique, a donné une grande impulsion au projet européen. Cependant, nous avons vu, qu'il peut en résulter plus d'hétérogénéités et de défis, afin de superviser près de 750 millions de citoyens européens.

La monnaie unique a un impact sur les membres de l'UE non-membres de la zone euro. Nous suivons ces impacts, des problèmes monétaires à la flexibilité du marché du travail. Dans l'Union Européenne, pour que l'Euro ne soit pas le Caïn de cet Abel, les préoccupations économiques, politiques, sociales et sociétales restent des sujets brûlants à analyser. La convergence économique, de pays hétérogènes, apparaît comme le long labyrinthe de Dédale, où les hétérogénéités en sont la clé de voute. Comme la quête de Galaad cherchant le Saint Graal, dans les légendes du roi Arthur, l'Union Européenne court après les intérêts économiques, apologie des échanges internationaux, où le trilemme compétition-coordination-coopération devient le dogme ultime de plus d'un demi-siècle de paix.

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List of acronyms

ALMP	Active Labour Market Policy
CEECs - PECO	Central and Eastern European Countries - Pays d'Europe Centrale et Orientale
CERDI	Centre d'Études et de Recherches sur le Développement International
EA	Euro Area
EC	European Commission
ECB - BCE	European Central bank - Banque Centrale Européenne
EDIS	European Deposit Insurance Scheme
EMU	European Monetary Union
ERM-II - MCE-bis	Exchange rate mechanisme - Mécanisme de Taux de Change
EU - UE	European Union - Union Européenne
EU-15	EU-15 countries
EU-13	EU-13 countries (same definition as CEECs)
EU-28	EU-28 countries
FEVD	Forecasted Error Variance Decomposition
GMM	Generalized Method of Moments
IV	Instrumental Variables
IRF	Impulse Response Function
LFPR	Labour Force Participation Rate
NKPC	New Keynesian Phillips Curve
NMS	New Member States
OECD	Organization for Economic Cooperation and Development
OLS	Ordinary Least Squares
PPP - PPS	Purchasing Power Parity - Purchasing Power Standards
PSE	Public Spending on Education
SGP	Stability and Growth Pact
SRM	Single Resolution Mechanism
SSM	Single Supervisory Mechanism

List of acronyms

VAR	Vector AutoRegression
WWI-II	World War I-II
ZLB	Zero Lower Bound

1 Background: Transition economies' odyssey

Brève d'histoire

Our story begins, in a very old time, centuries before JC, while Malta is alternatively under the Phoenicians, Greeks and Carthaginians occupation. After centuries of domination, time has come for Roman, to conquer Central and Eastern European countries. Roman expansion is synonymous of Christian's conquest, up to the Baltic states and during the next centuries, these territories become a major concern of political greed. The Habsburg dynasty, born in Austria during the 11th century, expands and do not hesitate to swallow the Bohemian kingdom (currently Czech Republic), two hundred and fifty years after they get the control over Slovenia. In the South-Eastern part of Europe, the Ottoman obtain the stranglehold of part of the actual Romanian territory. In the middle of the 16th century, the Habsburg and the Turkish share Hungary, after the Ottomans have conquered Budapest in 1541.

In the North, Poland and Russia face some conflicts aiming at controlling the Baltic states. It is, during the first quarter of the 18th century, that Russia annexes the coveted territories, while at the same time, Hungary obtain a certain level of independence, from the Habsburg. The end of the 18th century corresponds to the fall of the Polish kingdom, induced by the dynamics of the Russia and Austro-Hungarian Empire expansion. For almost a hundred years, Poland "disappears" from the European maps. The rise of nationalism characterized the 19th century, like in Hungary, Croatia and Czech Republic in 1848, in Lithuania in 1864 and Estonia in 1869. WWI brought significant changes and the days following the Russian Revolution, 1918 represent the turning point for almost every country in the CEECs. Trianon and Versailles treaties gave rise to the emergence of two new states, namely the Czechoslovakia (until 1992) and Yugoslavia (Slovenia, Serbia, Croatia and Montenegro). Under the supervision of Tomas Masaryk,

Czechoslovakia becomes becomes an authentic liberal democracy backed by a strong industrial development. It is also in 1918 that Latvia and Lithuania become independent (except for Vilnius, belonging to Poland); Romania, the first December of 1918, followed during the next years by the Saint-Germain en Laye treaties, becomes a unitary state and recover the Transylvania region. Poland falls under the authoritarian regime of Pilsudski. Estonia and Latvia are declared as independent, two years later, in 1920.

WWII is followed by the expansion of the Soviet Block and 1989 jeopardizes the geopolitical context of the EU. In 1993, the "velvet revolution" peacefully closed the Czechoslovakia chapter. Fifteen years after the fall of the Soviet Union, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia and Slovenia join the European Union; Bulgaria and Romania follow the movement in 2007 and Croatia in 2013.

Storytelling

Before digging deeper, the peculiar context of the CEECs, section 1.1 of this chapter, positions our following work, on international economics. We try here, to expose the paradigm that leads economies to interact. In the run of welfare and wealth, increasing commercial linkages, until implementing monetary institution, seems to be the indistinguishable, intrinsic counterpart, of economic development and economic growth.

Section 1.2 leaves the flour to the CEECs economic transition. We depict, from the nineties, up to the recent ERM-II accession of Bulgaria and Croatia, the transition process, strongly correlated with economic convergence. We try to summarize, thirty years of economic growth, in the European context, under convergence criteria, in both real and nominal terms.

Last but not least, section 1.3, as a prequel to the corpus of this thesis, lays the ground of the different chapters. We safely drive the reader, from monetary challenges and seemingly tightened labour market, toward human capital issues. Doing so, we clearly highlight the tricky-thorny multidimensional puzzle, transition economies have been going through; this bumpy road, on which countries have embarked with fervour and determination.

"Im Westen, nichts Neues"[1], let's look East.

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[1] Original title of "All Quiet in the Western front", novel from Erich Maria Remarque, first published in 1929.

1.1 International trade, cooperation, integration

1.1.1 Gains from trade

International trade has long been characterized by a zero-sum game, where the domestic production has to be promoted and foreign exports stemmed. The apocryphal sentence, from Abraham Lincoln, summarizes the underlying notion of protectionism: "I do not know much about the tariff, but I know this much, when we buy the manufactured goods abroad, we get the goods, and the foreigner gets the money. When we buy the manufactured goods at home, we get both the goods and the money."[2]

During the 18th century, Martyn (1701) described the premises of (unidirectional) gains from trade (at least in the UK); almost two hundred years later, Ricardo (1891) filled the gap, India also benefits from trade with the UK, under the *comparative and absolute advantages* assumptions.

In France, J.B. Colbert (Louis XIV), backed on trade surpluses, increases gold holdings; a set of policies known as *mercantilism*; French state promotes it's domestic production (tariffs on import), restricts raw materials exports and develop merchant fleet, with the navy to protect it.

Following, many theoretical (Dornbusch et al., 1977; Samuelson, 1964; Krugman, 1979) and empirical (Frankel and Romer, 1999; Dollar and Kraay, 2004; Dreher, 2006; Hidalgo et al., 2007) papers have been written on the international trade development.[3] The main idea, behind this flourishing literature, is to understand, to what extent, international trade and the underlying openness, is able to foster economic growth (Chang et al., 2009) and to a broader extent economic convergence (Ben-David, 1993).

From Sachs et al. (1995) to Feyrer (2019), it is decades of debate, to disentangle the tricky relationship between trade and income. The main challenge of the last recent literature is to address the apparent causality puzzle, between these two, using geographical proximity to shade the light on the impact of technological changes as a "decreasing distance" factor, between countries (Feyrer, 2009, 2019).

> **Box: Trade as the keystone of the European Union**
>
> The importance of international trade, in Development Economics, has long been es-

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[2] According to Taussig (1914), no consistent proofs exist about the fact that A. Lincoln truly said this. Many different versions of this sentence are found on the internet, even with anachronisms, we use the Rodrik (2011) version.

[3] Following Ricardian models, the HOS developments from Ohlin (1935), Stolper and Samuelson (1941) and Samuelson (1948) provide the theoretical formulation from international trade and its importance to explain its role on globalization

tablished, during the 50's, while the European Coal and Steel Community (ECSC - 1951) begins, under the impulsion of a more peaceful Europe. According to Parsons (2002), the European Economic Community (EEC - 1957 - Treaty of Rome), through its leaders, has used the ECSC economic institution, as a vector orchestrated to go beyond, the standard bureaucratic and diplomatic cooperation; eve of the European Union. The common market framework is solely based, on the *economic cooperation* idea, laying the foundations of zero tariff barriers. During the first fifteen years, of the EEC, intra(extra)-community trade increased six(three) folds.[a] According to Arto et al. (2018), one out of seven jobs in the EU-28 depends on international trade; the EU is the biggest manufactured goods and services exporter and the first tourist destination. The EU trade policy is the largest worldwide integrated policy, fully on the competency of the EU and refers to the Roma treaty (1957), with the concept of a single market and the European Customs Union created in 1968.

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[a]https://www.strasbourg-europe.eu/milestones-in-european-construction/

1.1.2   From trade union to monetary union

We have seen that trade is usually associated, with an international welfare increase and that the EU essence is to reinforce commercial interdependences, through a trade union. However, drawing an external trade policy (at least trade agreement) does not fully respond to the transaction cost issue. Indeed, tariff agreements and to a larger extent, free trade area with a common external tariff, are not the solely existing barriers, firms face, with their trading partners.

The currency and the underlying exchange rate risks still hold and may introduce, a lot of uncertainty, from both debtors and creditors sides. To annihilate this currency risk, a solution, further to the trade agreement, is to draw a currency union. Currency unions were first established in Germany, in 1834. Nowadays, we count almost twenty unions of this kind, among them the United Sates Dollar, the Sterling (semi-formal), the Euro, the CFA franc.

Friedman (1953) states that the flexible regime dominates the other exchange rate regimes. Nominal fluctuations allow external adjustments, in case of idiosyncratic shocks, substituting to internal adjustments, mainly through unemployment (Mundell, 1961). Since, economic theory, like the famous Optimal Monetary Union from Mundell (1961), has been trying to disentangle, costs and benefits, from a monetary union, that appears to be mostly, a political leitmotiv.

The monetary gains, from integrating a currency union, benefit first the monetary institutions. According to Alesina and Barro (2002), monetary credibility is restored, with an efficient anchored inflation expectation, while monetary efficiency is strongly correlated, with its credibility. Domestic central banks tie their hands, in case of idiosyncratic supply shocks. Both leader and follower central banks gain from such a commitment (Chari et al., 2020). We observe convergence in terms of interest rates and inflation.

The monetary union comes with the loss of the monetary policy autonomy. However, Rose and Van Wincoop (2001) estimate that, even if members cannot anymore use domestic monetary instruments, to smooth business cycles, the gains from lowering trade barriers[4] swamp the costs. To McKinnon (1963), commercial openness argues in favour of the monetary union. A relatively high rate of imports/exports to GDP, between monetary union members, increases the diffusion of idiosyncratic shocks (through a decrease in the demand for foreign goods). The Central Bank turns out to drive a more accommodating monetary policy. According to Frankel and Rose (1998), the trade argument is mostly endogenous to the concept of the monetary union. Frankel and Rose (2002), using a two stage approach, first conclude that belonging to a monetary union triples trade, with members and as trade increases income (second stage), then being part of a monetary union has important beneficial effects.

Recent international trade theory developments look at the specialization versus homogenisation of the production structure. According to Kenen (1969), homogeneity allows a stronger idiosyncratic shocks diffusion. Economic geography, à la Krugman (1991), highlights regional economic agglomeration, endogenously leading to increasing heterogeneities and uneven migration flows i.e., a negative outcome.

Labour mobility acts as an important adjustment factor, in case of nominal rigidities,[5] to absorb asymmetric shocks. In the absence of exchange rate adjustment and with a single monetary policy, that do not react to idiosyncratic shock, as is the case in a monetary union, inter-regional labour mobility allows the diffusion and the attenuation of the shocks, across the overall union Kenen (1969). According to Redding (2016), welfare gains from trade, crucially depend on the reallocation of population across locations. In this vein, Constant and Zimmermann (2013) highlight the allocative efficiency improvements of the EU labour market thanks to free labour mobility. However, in the EU context, despite persistent wage differentials,

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[4]The most common trade barriers, in this case, refers to the currency risk, which disappears when two countries adopt the same currency. We expect a decrease in transaction costs. Von Hagen (1992) recall the importance, of the monetary stability, as an argument in favours of a currency union ,to foster progress, toward the completion of an efficient internal market. It also prevents competitive disinflation, like observed in France during the 1983-1992 period, under L. Fabius government.

[5]The problem vanishes in case of perfectly flexible real wages. Empirical works like Benigno and Lopez-Salido (2006), tend to conclude in favour of nominal rigidities in the case of the Euro Area, with a relatively lower labour mobility than the one observed in the US.

that should act as an international migration driving force (Razin and Sadka, 1997), cultural differences and heterogeneous social systems, increase migration costs i.e., a disincentive effect.

1.1.3 The monetary union and fiscal federalism

We have seen, in the previous sub-section, that a monetary union is built on trade dependency, labour mobility and monetary credibility. The US monetary union was created at the end of the 18th century. According to Rockoff (2000), it took roughly two hundred years, to get a currency union, close to theMundell (1961) optimal definition.

Krugman (1993) proposes a cautious view about the construction of the EMU and point to the necessary fiscal pan of a monetary union. The risk of increasing regional specialization, across members of EU, lies on the heterogeneity's development, increasing centripetal forces, reducing optimality. Increasing trade among the members won't be enough. Moreover, Lane (2006) conclude that the importance of trade, within the EA actually did not increased so much, compared to the worldwide trade development.

Those results cannot be analysed without labour mobility and fiscal transfer considerations. However, labour mobility, remains low, relative to what is observed in the US, (Bonin et al., 2008). Recent ECB reports highlight, despite surprising improvement toward risk-sharing (Cimadomo et al., 2018a), a still relatively low financial integration (Cimadomo et al., 2018b). According to Ingram (1969), a monetary union should be accompanied by the financial integration, which provides an insurance mechanism. A country, facing an idiosyncratic shock may borrow to partners, in order to maintain a certain level of domestic consumption. Partners tend to reduce their own consumption, through an increase in savings. At the end, we observe a decrease in consumption gaps relative to income changes. To the limit, such financial integration suggests some budgetary transfers between regions i.e., fiscal integration.

In case of idiosyncratic shocks, the conduct of fiscal policy may destabilized the common currency, e.g., in case of over-borrowing a state could end-up in a bailout scenario Von Hagen and Eichengreen (1996). Up to now, macroeconomic stabilization is missing in the Euro area; a lack instruments, to lean against asymmetric shocks Blesse et al. (2020). The fiscal coordination may enhance welfare and potentially offset the discipline effects imposed by the single monetary policy (Beetsma and Lans Bovenberg, 1998).

The idea behind the fiscal union is to provide a *dynamic* framework, where individual members face an *ex-ante discipline* and benefit from an *ex-post risk sharing*. The ex-ante counterpart should end up with a higher level of fiscal sustainability and a better resilience, in case of

negative idiosyncratic shocks. The ex-post counterpart prevents insolvency, sharing risks while the shock occurs (Dolls et al., 2016). This is a possible solution under a credible European system of transfers (Bordo et al., 2013). However, the impact of such *international* transfers, without neglecting the redistributive effect and increasing the fiscal stabilization, remains mitigated (Bargain et al., 2013). According to Bénassy-Quéré et al. (2016) and Berger et al. (2019), beside the political, democratic[6] and legal concerns, steps toward a fiscal union, with an adequate risk sharing and a constrained discipline, should help national government to face asymmetric shocks. Far from imposing a European fiscal federalism, many steps, derived from the fiscal integration process, may contribute to the different EU countries resilience (Barbier-Gauchard, 2008).

The underlying argument states that during the drop of the business cycle, it exists a risk of fiscal solvency crisis (Daniel and Shiamptanis, 2012). In the case of a currency union and even more with, as it does, banking systems, strong enough, to weaken government economic health, the fiscal dimension could help tackling *feedback loops* between sovereign and banking insolvency (Farhi and Tirole, 2018; Navaretti et al., 2016).

1.2 Transition economies and the peculiar case of the CEECs

From central planning to free markets, transition economies, like CEECs, face particular challenges, in their economic development and in their worldwide integration. According to UN (2020), almost half transition economies, as defined by IMF (2000) are now considered as developed economies.[7]

1.2.1 Economic transition

The definition of transition economies refers to countries, going through liberalization. As defined by Fisher and Gelb (1990), after the initial shock, driven by liberalization, inflation is expected to be brought under control.[8] This is the macroeconomic stabilization (IMF,

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[6]The democratic dimension also refers to the public opinion of such a new institution, like already analysed thanks to a survey in Italy by Franchino and Segatti (2019).
According to Acharya and Steffen (2017) the fiscal union do not seem to be, on the political agenda, while the ECB, through Outright Monetary Transactions (OMT) has increased the capital market integration, closing the gap between the monetary union and the need for a fiscal one.

[7]These are mostly European countries, namely Bulgaria, Croatia, Cyprus, Czechia, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovakia, Slovenia . They also refer to the EU-13 i.e., in reference to the 13 countries that joined the EU since 2004. Some statistics upon those countries are detailed in table 1.1 in this chapter appendix.

[8]The high inflation rate at the beginning of the transition comes close to the idea that during the planned-economies period, prices were set artificially low. The liberalization has had an immediate effect on prices,

2000). This mechanism is supposed to occurs relatively quickly and is the results of fiscal and monetary discipline.

Concomitantly to the macroeconomic stabilization, deep legal and institutional reforms will help, to provide a rigorous framework, enhancing competition (Laffont, 2005). Such a framework is supposed to restore the level of output, which sharply falls.[9]

The economic transition has also been driven by privatisation and restructuring, to leave the old State-owned enterprises system (Aghion and Blanchard, 1998).[10] These two mechanisms gave rise to a high level of unemployment. The decrease in public employment was not immediately followed, by an increase in private employment (Burda, 1993; Aghion and Blanchard, 1994; Blanchard, 1998). Private entrepreneurs, to remain competitive at the international level, strongly reduced the labour cost, in line with the productivity level. A necessary decrease in bureaucracy did not help to support the labour market.

The speed of adjustment is strongly correlated with institutional determinants, such that different macroeconomic paths are observed (Boeri and Terrell, 2002; Commander and Coricelli, 1995; Tichit, 2006). Privatizations, in the CEECs, appear to be an efficient strategy, as they were quickly followed by restructuring reforms, leading to relatively higher performance, compared to State-owned firms (Frydman et al., 1999; Nellis, 1999; Filatotchev et al., 2003). However, restructuring also happened in the public sector. As Keane and Prasad (2006) concludes, restructuring in SOEs helped moving, toward more competitive wages. As a sign, of the transition success-story, countries going through a stable decrease in inflation and an efficient set of structural reforms, quickly observed positive capital inflows.

Far from being resolved, the transition process remained complicated for years. Capital inflows, leading to increasing investments, suffer from the skill-gap, with an "old-fashioned" labour supply, in front of a labour demand determined to get a first place, on the international market. The skill-mismatch exacerbates inequalities that corruption and a rising criminality do not fight. To not end-up in a stagnation, on the back of more developed European economies, important investments in infrastructure and education, support their full integration, in the EU-supply chain. According to OECD (2019b), integrating the global value chain fosters the catch-up, boosting productivity and providing greater economies of scale and access to external markets.

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sustained by an increasing demand. Not surprisingly, average annual inflation hikes to more than 400% in the CEECs and even reaches 1000% a year in some Former Soviet Union countries.

[9]The unexpectedly huge fall of output, on average by 40%, has been partly explained by pre-transition overestimation.

[10]A recent report suggest that SOEs still plays an important role in the CEECs; it represents for example 8% of total output of non-financial corporations in Romania (i.e., employs around 4% of the labour force) EC (2016).

1.2.2 Economic convergence

The European Commission, every two years, publishes a "convergence report", to get a quick overview of the recent economic development, for countries still on the verge of the EA (EC, 2020a). The report focuses on five main issues to describe progress made by EU-members toward their EMU accession requirements.[11]

According to EC (2018), EU 2004-07 enlargements, toward the CEECs were expected to be followed by more convergence in Europe. Despite increasing GDP per capita, in the CEECs, evidence of convergence during the last decade are scarce.

Borsi and Metiu (2015) analyse the per capita income convergence in EU, between 1970 and 2010 and find no overall significant results, while in the pre-EMU period (1960-1995), Yin et al. (2003) highlighted both sigma and beta convergence. According to Hein and Truger (2005), the lack of significant results comes from the constrained policy mix, under accession criteria, that prevent real economic convergence.

> **Box: Economic convergence**
>
> Convergence may be in real and in nominal terms. While nominal convergence concerns variables like inflation or interest rates, the real convergence implies both economic and social indicators, to converge toward a common objective. The most commonly approach, to measure convergence in economic performance is to look, from one hand, at the dispersion across countries (i.e., the sigma-convergence: the tighter the gap, the more efficient is the convergence) and from another hand, to analyse variables growth rate, this is the beta-convergence. Beta-convergence, referring to the "catching-up process", poses that laggard countries should experience higher economic performance variable growth rate.

However, for Matkowski and Próchniak (2007) and Franks et al. (2018), CEECs progressed toward EU-15 standards, resulting in real economic convergence. And Siljak and Nagy (2018) find that the recent economic downturn has had a significant impact on absolute convergence. More generally, clubs of convergence appear (Borsi and Metiu, 2015), mostly referring to geographical location, with different clusters, even inside the EU-15 or the CEECs (Monfort et al., 2013). Such clubs have also been found at the regional level (Fiaschi et al., 2018), with weak

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[11]The five items are (i) the compatibility of national legislation; (ii) the price stability criterion; (iii) the criterion dealing with public finances; (iv) exchange rate criterion; (v) long-term interest rate levels; detailed definition of each item is given in the Treaty on the functioning of the European Union (TFEU - article 130-130 and 140). Some other secondary criteria are under consideration, see the TFEU and convergence report for more details.

convergence among them from 1991 to 2012. This regional geographical dynamic is important, to explain convergence issue, like observed by Quah (1996) and Maza et al. (2012). Regional idiosyncratic shocks play a significant role, to disentangle the convergence process (Beyer and Stemmer, 2016). According to Beugelsdijk et al. (2018), the persistent differences at the European regional level may be explained, thanks to heterogeneous total factor productivity (TFP), while geographical and historical components limit the inter-regional diffusion process. Looking at wage convergence amongst European regions, between 1996 and 2006, Naz et al. (2017) conclude on efficient convergence at the internal regional level, but not in international cross borders regions. For Martino (2015), regional convergence may be heterogeneous depending on the production sector. They end up with unconditional convergence in the financial- and business-related market services but no empirical evidence of convergence on the manufacturing sector or aggregate productivity.

Improvements seem better when focusing on the GDP per capita in PPS (EC, 2018). However, figure 1.1 highlights the remaining gap between the CEECs and the overall EU-28 (average data from 2015 to last data available). The gross adjusted disposable income in PPS[12] is still far below the EU-28 average. No CEECs reached the EU-28 average and at the extreme of the distribution, Bulgaria still has a disposable income twice smaller, than the rest of the EU-28. Zuk and Savelin (2018), despite many improvements on human capital and an efficient switch from agriculture to more productive sector, in most of the CEECs, insist on the role of institutional quality, innovation and investments, to achieve an efficient real convergence process.

Figure 1.7 illustrates the nominal convergence process, among EU-28 countries. Before 2000, we only include EU-15 economies and observe a strong sigma-convergence until the start of the monetary union. After 2000, convergence suffers from the economic downturn, with the 2008 economic crisis and the 2012 sovereign debt crisis. Nevertheless, looking at the beginning of the 2000's and most recent data, dispersion of bond yields significantly decreased. The variance of the variable is divided by 2.5 over the last twenty years.[13]

1.2.3 The CEECs in the European Union

Back to the 1990's, the CEECs need less than two decades to join the European Union. The two last enlargements of the EU, respectively in 2004 & 2007 (plus Croatia in 2013) integrate the

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[12]The adjusted gross disposable income is measured in Euros, per capita, in PPS i.e., in purchasing power standards, to allow the countries' comparison.

[13]Excluding Romania from the sample at the end of the period leads to an even higher decrease in the variance, reinforcing the nominal convergence concept.

Figure 1.1 – Gross disposable income pc-pps
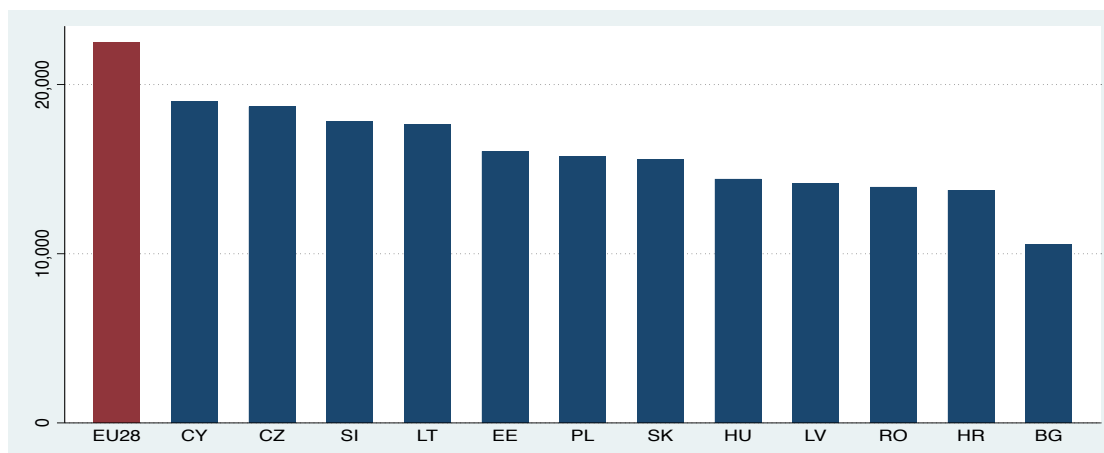
Source: Eurostat [TEC00113];
Notes: The graph 1.1 displays the gap between EU-28 and the CEECs, regarding the groos disposable income, on average, since 2015 to last data available.

so-called EU-13 group, namely the CEECs. Such a rapid integration is not surprising from the international trade perspective.[14] The openness degree of the CEECs is indeed, on average 1.5 times higher than the EU-28 average (graph 1.2).

To disentangle the important role of international trade, in the CEECs, we can focus on trade with EU partners, as an EU-28 economic dependency. Graph (1.6), in appendix, presents the share of imports (x-axis) and exports (y-axis) toward/from EU over total imports (respectively exports). We observe that most CEECs are located in the North-East of the graph, meaning that their international trade relies relatively more on EU-28 countries. As the two sides of the same coin, this is associated, with strong integration but also higher dependency and higher risks, when the EU-28 face an economic slowdown.

The rapid increase of international trade, with the rest of the EU, has nothing to do with chance. We observe among the CEECs, a real political concern to integrate, as far as possible, the European supply-chain. One of the most obvious achievement, of this strategy is the Visegrad group, implemented between Czech Republic, Hungary, Poland and Slovakia, based on optimum cooperation and on the idea of fostering the EU integration process.[15]

The EU accession is conditioned, in the middle term, to the adoption of the Euro, as

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[14]To visualize the timeline of the CEECs EU integration, refer to figure 1.5 page 35.
[15]More upon the Visegrad 4 is detailed on appendix 1.B page 40.

Figure 1.2 – Trade openness
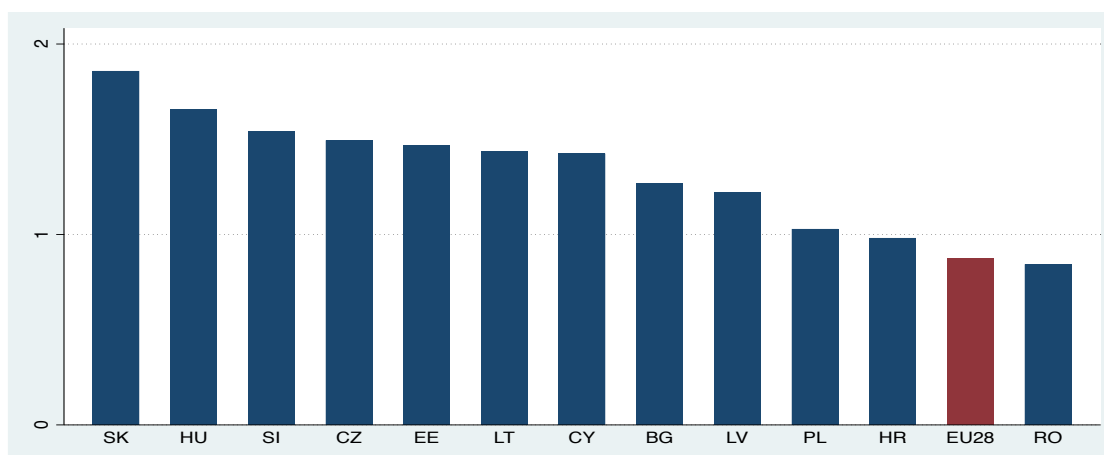
Notes: The graph (1.2) demonstrates the relatively high international openness of the CEECs compared to the rest of the EU (in 2018). Openness is measured as the ratio of import plus export over GDP.

a single currency. Only Denmark and Sweden do not participate, on a voluntary basis, to the Euro area.[16] To be part of the EA, EU-non-Euro members, have to fulfil the so-called convergence criteria, fixed by the Maastricht treaty. Euro area candidates have to maintain price stability and sound public finances. To prove, they are strong enough, to support the loss of the monetary policy discretion,[17] they also have to attain exchange rate stability, within the Exchange Rate Mechanism (ERM-II) and to maintain their long-term interest rates, at a certain level. To a lesser extent, the balance of payments also enters into consideration. Besides the exception previously mentioned, Bulgaria, Croatia, Czech Republic, Hungary, Poland and Romania are still out of the Euro area.

A recent study, from Deskar-Skrbic et al. (2020), find relatively weak costs for Bulgaria, Croatia and Romania to join the EA; these three countries strongly respond to common factors, such that the EA accession will help stabilizing their business cycles. These results have been followed by Bulgaria and Croatia statements about their ERM-II entry, during summer 2020.[18]

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[16]They are particular cases in the Euro area creation. Denmark negotiated an opt out option and wait for another referendum. The recent European sovereign debt crisis does not encourage its implementation. Officially in the ERM-II mechanism, Denmark fulfils all criteria but remains out of the EMU. Sweden, on purpose, do not fulfil the required criteria such that the ERM-II entry is still postponed. We do not consider here the case of the UK as they are not EU member states anymore.

[17]Being part of the Euro area means the loss of the monetary policy as a policy instrument to respond to economic shocks, as the country enters the ECB board and adopt the single monetary policy, corollary to the single currency

[18]The central rate of the Croatian Kuna is set at 1 euro = 7.53450 kuna. The central rate of the Bulgarian lev is set at 1 euro = 1.95583 leva. The standard fluctuation band of plus or minus 15 percent will be observed around the

In August of the same year, Babis, the current Czechia Prime Minister, during an interview for the Harvard International Review, claims his country is ready to join the EA, Babis (2020). However, far from being a legislative priority, in 2019, more than two thirds of Czech citizens, opposed the EA entry.

According to a recent Eurobarometer report, trend about the willingness of citizens, to join the EMU, in countries still on the verge, did not changed so much, in the last years (EC, 2020b). While more than 60% of respondents are in favour of introducing the Euro, in Hungary or Romania, the same proportion is actually against, in Czech Republic or Sweden.[19] However, in every country, a majority of respondents estimates a current positive impact of the Euro on their domestic economy.

1.3 From monetary convergence until human capital issues.

In the last section of this first chapter, we briefly provide an overall framework that illustrates the context of our work, introduces our chapters and articulates our thinking upon the integration common thread. By systematically using the previous chapter conclusion, we derive new questioning, justifying our thoughts, overall reflexion through international integration complexity.

1.3.1 Monetary integration: EU-28 versus EA

The EMU, initially launched in 1992, provides a framework, to the economic and fiscal policies coordination, under the common monetary policy, drawn by the ECB. All 28 EU-members are part of the EMU, even if the country is not part of the Euro area. The fiscal coordination limits government debt and deficit. The European Central Bank drives an independent monetary policy (once the single currency is adopted).

Different European institutions interact within the EMU, with national governments to share responsibilities and to go deeper in EU economic policy coordination, particularly since the 2008 crisis and its impact on the Euro area weaknesses.

Besides the common currency, the EMU supports the single market through free movement of goods, services, capital and labour. A single banking system reinforces the Euro area, under

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central rate. Press release, July 10th 2020 https://www.ecb.europa.eu/press/pr/html/index.en.html.

[19]The last survey, conducted by the European Commission, was held in 2020, over 7016 citizens, living in EU member states, that have not yet adopted the common currency. Figures correspond to response for Q11: "Generally speaking, are you personally more in favour or against the idea of introducing the Euro in (OUR COUNTRY)?"

supervision and banking regulation to maintain confidence and safety (read more on the banking union in appendix 1.B page 43) .

In 2018, according to (EBF, 2019), the EU-28 counts around six thousand credit institutions (almost a third less than before the economic contraction). Nevertheless, according to the ECB, some countries, particularly in the CEECs, registered an increase in their credit institutions, over the same period. This is the case in Estonia, Slovakia, Poland or Czech Republic.

The banking sector development, in the CEECs is quite heterogenous with a relatively strong share of foreign branches (EBF, 2019), which tends to prove its importance, for the financial development (Cetorelli and Goldberg, 2012). In Czech Republic, 40 out of 49 licensed banks are under foreign control while the Czechs government control 2 out of 9 domestic banks. In Bulgaria, Estonia or Romania, foreign assets holding represent more than three quarters of all assets (respectively 78% in Bulgaria, 90% in Estonia and 75% in Romania).

Baltic banking sector is driven by Scandinavian banking groups. In countries like Malta or Romania foreign banks are mostly from Austria, Belgium, France or Italy. The Polish banking sector is one of the most resilient, among the CEECs with 32 commercial bank, 543 cooperative banks and more than fifty percent of assets hold by domestic investors. Almost half commercial banks are under domestic control (among them, two third are public) and all cooperative banks are domestically driven. The Slovakian banking sector is, to the contrary, highly concentrated as 3 out of 26 financial institutions hold fifty percent of the assets.

This description of the EMU fits perfectly to the situation we try to disentangle, in chapter 2. Indeed, in the EMU framework and more generally speaking, in the international context, with economic leaders, we expect foreign monetary policy to impact the domestic economy, even more in "small" open economies (Fratzscher et al., 2016), as is the case for the CEECs (see Box: Monetary mechanisms to some details on monetary policy channels and international spillovers).

Box: Monetary mechanisms - a quick overview

By charging interests on funds provided to the banking system, the central Bank drives the monetary policy. Any change, in the official interest rate, through the money-market interest rate, impacts the commercial banks' lending and deposit rates. Through agents' expectations, the monetary policy also influences the inflation rate. The development of the financial sector and international integration pushes the influence of the monetary policy far beyond, imposing adjustments in asset prices or toward the exchange rate. Following Beyer et al. (2017), the main purpose of the monetary policy is to maintain price stability, while assuring balanced economic growth. Nowadays, the monetary policy

cannot be understood without a clear understanding, of the role of micro/macropruden-tial policies, jointly implemented to the monetary policy to ensure the resilience and the stability of the financial system (see Beyer et al. (2017) for a clear understanding of the transmission mechanisms of the monetary policy). The international economics and the « impossible trinity » lead to monetary policy spillovers (Buch et al., 2018). During a recent speech, the Vice-President of the ECB, Luis de Guindos, among others, identified the three main international transmission channels, namely the aggregate demand, the exchange rate competitiveness and the financial channel (Guindos, 2019).

Regarding the importance of unconventional monetary policy measures, the topic of international monetary spillovers regains interest in the economic literature (Rey, 2015; Taylor, 2013). Both conventional and unconventional ECB's policies have significant impacts, towards the CEECs (Hájek and Horváth, 2016; Potjagailo, 2017).

In the vein of Babecká Kuharčuková et al. (2016) and Hajek and Horvath (2018), in chapter 2, we try to understand the magnitude of ECB's policy impact. After the 2008 economic downturn and the recent Euro-sovereign debt issues, the CEECs went through relatively faster recovery process (graph 1.3a). Meanwhile, the Euro area faced economic challenges. The ECB adopted measures, in line with the EA economic situation, i.e., unconventional measures and a ZLB strategy.

From the perspective of the CEECs, the international monetary context influences their own monetary and budgetary orientation. However, in the CEECs, a relatively high GDP growth rate is associated with some inflationary pressure (graph 1.3b), as is recently observable in Romania or Hungary. The ZLB of the ECB won't help.

We contribute to this flourishing literature, providing estimates of the ECB international monetary spillovers, using a panel of EU non-EA member. Doing so, we estimate the extent to which ECB's policy may shock the CEECs economy. Using the common empirical tools, to disentangle such spillovers, we provide an interesting average effect of the ECB monetary policy and the main channels at stake. A specific focus, on the period after the 2008 economic downturn, helps to clarify the CEECs monetary stability increase. We also associate higher inter-connection between nominal and real variables, to the integration and convergence process. As the adoption of the Euro, is conditioned to the ERM-II participation, for at least two years, we also draw a comparison between EU non-Euro members and recent CEECs that have joined the EA. Doing so, we highlight some possible evolution, in spillovers channel

(a) GDP growth rate (b) Inflation rate
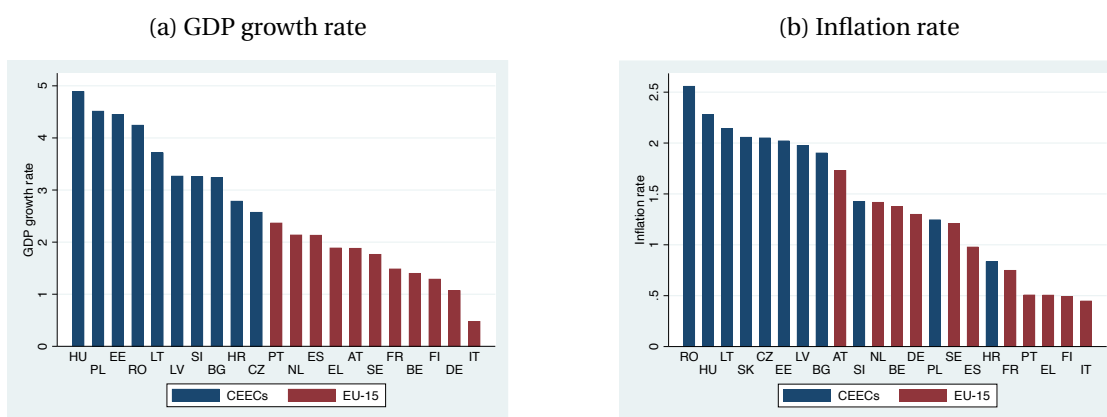
Source: Eurostat [namq_10_gdp] Source: Eurostat [prc_hicp_midx]

Figure 1.3 – Economic growth: GDP and inflation trends

Notes: The graph 1.3a presents, on average, quarterly GDP growth rate (yoy) from 2018 to last data available. On graph 1.3b, on average, quarterly inflation rate (yoy) from 2018 to last data available (HICP index excluding food and energy prices). These two graphs illustrate the faster recovery process after the recent economic downturn observed in the EU. On left graph, GDP growth rate are on average higher in the CEECs compared to the EU-15, as is the case for inflation rate on the right graph. It also highlights the underlying importance of monetary spillovers from ECB to peripheral countries.

according to the change, in the exchange rate regime (the ERM-II participation is associated with a "fixed exchange rate regime").

Our results are of particular interest for European policy-makers, to understand some possible challenges, they may face before the Euro adoption. From the domestic central banks point of view, we bring some insights, about possible impacts toward the real economy, of losing the full independence of the monetary policy. The main idea behind our results is that the switch between the exchange rate regimes may have repercussions beyond the monetary dimension.

1.3.2   The exchange rate (regime) matters

The Euro-system supervises the monetary policy implementation and is composed by the European Central Bank and the national central banks of the Euro area countries. The monetary policy focus on a below but close to 2% price inflation over the medium term. EU non-Euro members coordinate their domestic monetary policy (this is part of the conclusion we draw on chapter 2).

In parallel to the Euro system, the Stability and Growth Pact (SGP) aims at improving fiscal coordination and enforce fiscal discipline, within the EMU, to maintain sustainable public

finances, with a government deficits/debt below 3% and 60% of GDP respectively.[20] The SGP prevents excessive budget deficits, via fiscal planning, considering the fluctuations of the business cycle. National governments have to respect medium-term budgetary objectives and to provide programmes to explain, how they will reach their target. More recently, the EMU has been updated, with the Fiscal Compact and its balanced budget rule, leading to improved national fiscal frameworks.[21]

Following the seminal contribution of Phillips (1958), we empirically expect a negative relationship between prices and unemployment. This result is line with Jorda and Nechio (2018) who argue the verification of this relationship as an indicator of monetary policy efficiency. As argued above, the mandate of the ECB is to maintain price inflation under a certain level. Beside the single monetary policy, the SGP provides a strong framework to drive the budgetary policy. In this context, it seems that both monetary and budgetary policies are under supervision. We have seen in chapter 2 that the ECB monetary spillovers directly impact real CEECs economies.

Box: ERM-II - Exchange rate mechanism

The Exchange rate Mechanism (ERM-II) ensures that exchange rate fluctuations, observable between EA members and other EU-28 countries, do not penalize the economic stability into the single market, provided by the EU status. The participation to the ERM-II is a voluntary mandatory step, at least for two years, toward the Euro adoption. In 2020, three countries participate to the ERM-II, namely Denmark (fluctuation band +/- 2.25%), Croatia (fluctuation band +/- 15%) and Bulgaria (unilaterally continues its currency board arrangement). To maintain the exchange rate, within the defined fluctuation bands, the domestic central bank and the ECB implement coordinated interventions. During the ERM-II, national governments will prove their ability to use budgetary and structural tools instead of monetary instruments to manage their economies.[a]

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[a]Source: European Commission

The CEECs in their integration process have to go through the ERM-II (see box: ERM-II). Doing so, the exchange rate instrument is impacted. Policymakers have to adapt to the weakened policy discretion.

---

[20]Recent economic downturns, following the 2008 and 2012 crisis and even more recently the 2020-pandemic, rose the question about such thresholds at least in the small-medium term, corroborating Minea and Parent (2012) and the non-linear impact of indebtedness on GDP.

[21]Without a Union legal order, the Czech Republic and Croatia did not adopt this treaty on Stability, Coordination and Governance.

Moreover, during the last decades, we observe relatively low level of unemployment and inflation in the CEECs, which seem, primarily, to be counterintuitive, to the Phillips curve hypothesis.

In this chapter 3 , we question the impact of the conduct of the European monetary policy on smaller EA countries. This question is of particular interest as the literature establishes a strong negative relationship between inflation and unemployment. We use the New-Keynesian Phillips curve literature (Coibion et al., 2018) and the novel approach on identification strategies (Jorda and Nechio, 2018; McLeay and Tenreyro, 2020). We provide some new insights, on how the inflation-unemployment stylized fact evolved according to the EU integration. It seems that smaller economies potentially lose monetary independence relative to the economic leaders of the EA.

Policy implications of chapter 3 are twofold. From EA members, we reinforce the necessary resilient structural and budgetary policies, in case of idiosyncratic shocks, in front of the lack of possible monetary adjustment. From EU non-Euro members, we bring back the idea of business cycle synchronization before the EA accession, to increase homogeneous behaviours.

1.3.3 Homogeneity: a labour market perspective

A monetary union is formed by different countries, sharing a common currency. The monetary union is said to be an optimal currency area, if the common currency is not associated, to a negative outcome on welfare (see box OCA). The easiest way to understand such a potential drawback is to measure the impact of the loss of the exchange rate instrument, as an adjustment monetary tool. Giving up the exchange rate instrument may be problematic, in case of asymmetric shocks. To counterbalance the loss of the monetary autonomy, economic theory suggests two other mechanisms of adjustment.

> **Box: OCA - Optimal Currency Area**
>
> The seminal paper Mundell (1961) lays the ground of the OCA theory. Countries may benefit from sharing a common currency whether certain conditions hold. According to the initial statements, a high labour and capital mobility, price and wage flexibility and a currency risk-sharing smooth asymmetric shock. If countries, by the way, also share a common business cycle, then the exchange rate instrument becomes no longer useful. Later developments suggest a high trade integration, between member states and a diversified production, within economies (I.e., intra-branches specialization). To complete the OCA, homogenous policy preferences favour an efficient political cooperation.

First, mobility of production factors helps to smooth the impacts of the idiosyncratic shock. For example, in case of a negative shock, labour mobility will increase following the drop on wages, induced by the shock. Doing so, the negative consequences, such as an increase in unemployment (i.e., underutilization of production factors) may automatically decline. Under perfect factor mobility, the exchange rate instrument, after an idiosyncratic shock becomes useless.

Second, a solution consists of reducing the risk of asymmetric shock. This is possible, if domestic production is similar, between the different members (indeed, in this case, every member suffers from the global demand shock on a specific good). On the contrary if the basket of goods is fully diversified, then a shock on one good will marginally impact the economy. The global value chain developments, in the European perspective, comes close to the reduction of asymmetric shock probability but is of course not sufficient.

Factors' mobility is allowed through financial openness and free labour mobility inside the European Union. Labour mobility across member states is managed by the EU status and should not compromise the main directives of the Schengen area (see box Schengen area). Under the optimal currency area assumption, we expect labour flows to smooth inequalities between regions.

According to Eurostat migration data, by nationality, inside the EU, among the CEECs, the international mobility is relatively high. On average, the CEECs diaspora count for 8% of their citizens (against slightly less than 4% in the EU-15) and concentrates in the EU-15 countries. Migratory flows are mostly illustrated by East-West or East-East flows (less than 1% of EU-28 migrants in the CEECs comes from the EU-15).[22]

> **Box: The Schengen Area**
>
> Corollary to the European Union, the Schengen area[a] is the direct implementation of the free movement of persons within the Union. Every person in the Schengen area won't cross any internal border checks. Besides one of the greatest achievements of the EU, Schengen states, to ensure security, tightened controls at the external borders. This has been made possible thanks to information sharing mechanisms (like Visa Information System [VIS] or the Schengen Information system [SIS]), keystone of the cooperation. Up to now, Bulgaria, Croatia, Cyprus, Ireland and Romania do not take part of the Schengen Area.[b]. Indeed, joining the Schengen Area requires a list of pre-conditions fulfilment among them are the responsibility for controlling the external borders and the efficient

[22]This last point is consistent with the view that East-East migration is particularly observable among Baltic states and/or between the Czech Republic and Slovakia (historical background).

cooperation with law enforcement agencies (security issue).

[a]Source: European Commission website
[b]Bulgaria, Croatia and Romania are in the process

The European labour mobility does not seem to be sufficient, regarding the poverty and social exclusion. One out of six inhabitant lives under the poverty threshold. The highest poverty rates are observed in Romania, Bulgaria and the Baltic states (at risk of poverty rate higher than 20%)[23]. The lowest poverty rate is found in Czech Republic (9.6% in 2018). Social inequalities, measured via the Gini coefficient,[24] are relatively low in Slovakia, Slovenia or Czech Republic, three CEECs. But to the other extreme of the distribution, three other CEECs are the most unequal, namely Bulgaria, Lithuania and Romania.

While we have observed relatively higher migration flows in the CEECs, it seems that the poverty reduction has remained low. To foster the regional development, the cohesion policy aims at reducing regional heterogeneities, to counterbalance the inability of labour mobility, to smooth inequalities (more on Social Cohesion Policy in appendix 1.B). As we previously mentioned, the efficiency of a monetary union lies, to some extent, on the ability of economies, to homogeneously react to shocks (common business cycle). The purpose of chapter 4 responds to that statement. Our contribution is to understand whether regional adjustment channels provide a stable environment, regarding the European union context

The relatively weak mobility, in the CEECs, during and after the first phase of the transition, induced a persistent high regional unemployment (Boeri and Scarpetta, 1996; Campos and Coricelli, 2002; Fidrmuc, 2004; Jurajda and Terrell, 2009). The regional dimension of the labour market appears as a solid argument to understand the dynamic of adjustment mechanisms (Blanchard et al., 1992) and to tackle regional (sectoral) heterogeneities (Marelli et al., 2012; Rios, 2016).

Focusing on NUTS-2 European regions, over the last twenty years, we have found that regional labour markets tend to adjust, relatively more toward the unemployment channel, in the CEECs, compared to the rest of the EU-28.[25] Despite an increasing share of workers mobility, the weaker wage adjustment channel involves lower resilience, in case of negative employment shock, in relatively poorer (and/or agricultural) regions. This brings, up to date, the need to implement coherent regional development projects (as done toward cohesion policies),

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[23]Source: Eurostat code: TESPM010

[24]The Gini coefficient measures the distribution dispersion of a variable, purely statistical indicator, it allows to apprehend how a country is far from the best situation. The lower the index, the higher equality (100= perfect inequality).

[25]On appendix 1.A, we provide a static diagram analysis of labour market adjustments to visualize both unemployment and wage channels, following a shock on the labour demand (figure 1.8)

to foster regional convergence and to design the European Employment Strategy, toward inclusive programs. The gender distinction provides the policymakers with interesting avenue to increase the women penetration rate, through infrastructure and education investments, relatively low compared to other EU countries. Such a strategy should increase the labour supply flexibility and resilience, in case of negative employment shocks.

1.3.4 Smart growth: education toward inclusive growth

The EU-2020 strategy is the EU's agenda, for growth and jobs, designed as the successor to the Lisbon strategy. The EU-2020 plan aims at emphasizing smart, sustainable and inclusive growth, articulated around five areas, to better promote Europe's competitiveness and productivity, to be part of a sustainable social market economy. The headline targets cover (i) Employment, (ii) Research & Development (R&D), (iii) Climate change & energy, (iv) Education and (v) Poverty & social exclusion,[26] under the three following concepts of growth:

- *Smart growth*

    - Increasing combined public and private investment in R&D to 3 % of GDP

    - Reducing school drop-out rates to less than 10 %

    - Increasing the share of the population aged 30–34 having completed tertiary education to at least 40%

- *Sustainable growth*

    - Reducing greenhouse gas emissions by at least 20 % compared to 1990 levels

    - Increasing the share of renewable energy in final energy consumption to 20 %

    - Moving towards a 20% increase in energy efficiency

- *Inclusive growth*

    - Increasing the employment rate of the population aged 20–64 to at least 75 %

    - Lifting at least 20 million people out of the risk of poverty and social exclusion

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[26]Because of the high level of heterogeneity among the different European countries, EU-level targets have been translated into national specific goals, to better reflect the specific contexts. Such national targets are detailed in appendix 1.C. Up-to-date results of the headline indicators are also available on the scoreboard (table 1.2 in appendix 1.C page 43. Last, we provide a summary, for each topic but education (analysed in this section and main purpose of chapter 5).

According to the European pillar of social rights, 'Everyone has the right to quality and inclusive education, training and life-long learning, in order to maintain and acquire skills, that enable them to participate fully in society and manage successfully transitions in the labour market'.

The EU-2020 designs a framework to build best practices in education policy based on a lifelong learning approach, covering all the challenges from early childhood to adult vocation training and higher education. Fostering the participation to early childhood education, kills two birds with one stone. At a first glance, it allows both parents to participate, to the labour market, especially for parents with disadvantages backgrounds. Quality early childhood education and care also have an impact on employability, well-being and social integration for later success in life (Campbell et al., 2014; Burger, 2010).

The labour demand, looking for more skilled workforce, excludes people without educational background. For this reason, the EU-2020 strategy integrates in its goals, the reduction of early school leaving and its consequences like unemployment, social exclusion, poverty and poor health. The share of early leavers from education and training[27] decreased over the last decade from 14.7% in 2008 to 10.6% in 2018, close to the 2020 targets of 10 percent. Providing an adequate education system and school climate is a mandatory condition to avoid school-leavers, to drop out of the system. Integrating firms, in vocational training, motivates students, to acquire the necessary technical skills, to increase their future employability.

The labour demand is on constant evolution, with even more specific needs of knowledge and skills. In those aspects, the EU needs a skilled workforce, to remain competitive and offer a high labour productivity. EU education policy is turned toward this objective. Education allows a continued innovation but also aims at reducing social exclusion and promoting social inclusion. Some recent elements present an increasing skill-mismatch, on the labour market. To avoid such a phenomenon, it is of primary interest to clearly identify and anticipate the future skills needs and to provide an effective education and training strategy. Policies turned toward vocational education, training and adult participation in learning, reinforce the necessary links between schools, labour demand and supply.

The specific labour demand requirements force individuals to engage, in highly educational attainment, to get a stronger skilled human capital. Tertiary education and its links with research and innovation lay the foundation of individual and societal developments, while fostering job creation and innovation (see figures 1.4a and 1.4b to get an overview of the educational attainment of the European population).

According to Commander and Kollo (2008), job creation, during the transition, were turned

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[27]The share of early leavers from education and training is defined as the share of 18- to 24-year-olds with at most lower-secondary education and not in further education and training.

(a) Tertiary educational attainment   (b) Tertiary educational attainment evolution

Source: Eurostat EU-LFS [T2020-41]   Source: Eurostat EU-LFS [T2020-41]
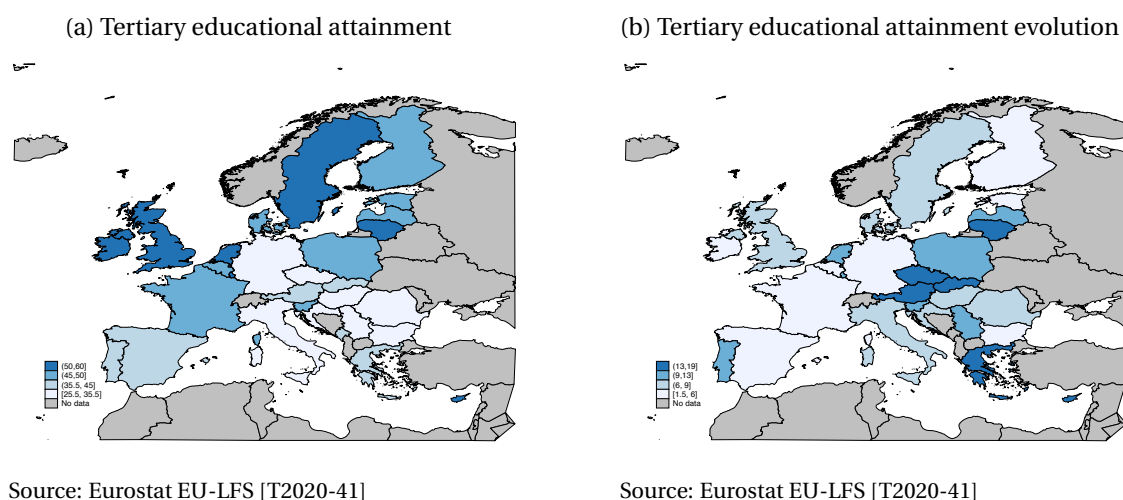
Figure 1.4 – Education: a quick overview

Notes: Graph 1.4a presents tertiary educational attainment, by country, in 2019; Percentage of the population aged 30-34 who have successfully completed tertiary studies (ISCED 5-8). The graph 1.4b corresponds to the percentage points increase, by country, from 2010 to last data available.

toward higher skilled workforce. They point out the necessary rise on education expenditures , combined with the restructuring of the education content, to better fit new skills requirements. They corroborate Aghion and Commander (1999), who've found that policymakers and firms involved in education's improvement, tend to reduce inequalities. Chapter 5 comes close to this idea, trying to capture both dimensions of education (i.e., quantity and quality) to drive the fundamental role of human capital, in a growth enhancing process.

The role of human capital as a determinant of economic growth is an old question in the literature (Lucas, 1988; Mankiw et al., 1992; Benhabib and Spiegel, 1994). More recent contribution focus on two different aspects behind the human capital i.e. its measurement (Zhang and Zhuang, 2011; Barro and Lee, 2013; Lim et al., 2018) and its financing (Acemoglu et al., 2006; Agénor and Canuto, 2015; Annabi, 2017; Dissou et al., 2016).

In chapter 5, we revisit Blankenau et al. (2007) growth equation by introducing the concept of efficient public spending on education, to reconcile the human capital impact, on economic growth.Increasing public spending on education per se., do not generate human capital and could explain the lack of significant impact from public spending, to economic growth. Using our efficiency measure à la Lim et al. (2018), we are able to distinguish countries, by their spending efficiency level. Doing so, we restore a positive impact, of public spending on education, toward economic growth. From the European perspective, we contribute to disentangle the human capital quality issue, found by Neycheva (2010, 2019).

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Appendices for chapter 1

1.A   The CEECs and the European Union

Figure 1.5 – CEECs integration process
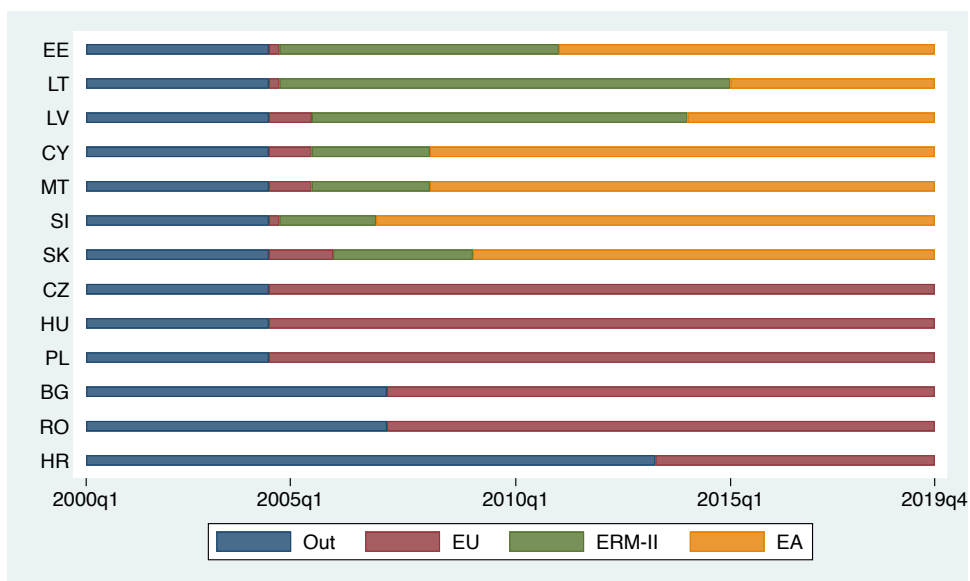
Notes: The graph 1.5 presents a timeline of the EU accession process of the CEECs, to easily capture each country status over time.

Table 1.1 – Main country figures

Country	Population	Area	GDP	Unemp-loyment	Public Debt	HDI	Agriculture
EU-28	513,472		16,464,167	6,3	79,3		3,61
							(7.5)
Bulgaria	7,000	110,370	60,675	4,2	20,4	0,794***	6,49
	(1.36)		(0.37)				(2.56)
Czechia	10,650	78,868	223,945	2	30,8	0,891*	2,62
	(2.07)		(1.36)				(14,76)
Estonia	1,325	45,227	28,037	4,4	8,4	0,882*	3,14
	(0.26)		(0.17)				(20,57)
Croatia	4,076	56,594	53,936	6,6	73,2	0,827**	5,56
	(0.79)		(0.33)				(6,94)
Cyprus	876	9,251	21,943	7,1	95,5	0,856**	2,06
	(0.17)		(0.13)				(4,56)
Latvia	1,920	64,573	30,476	6,3	36,9	0,830**	7,34
	(0.37)		(0.19)				(14,47)
Lithuania	2,794	65,286	48,432	6,3	36,3	0,848**	6,24
	(0.54)		(0.29)				(8,13)
Hungary	9,773	93,011	143,826	3,4	66,3	0,836**	4,66
	(1.90)		(0.87)				(3,92)
Malta	494	315,4	13,277	3,4	43,1	0,885*	0,93
	(0.1)		(0.08)				(0,41)
Poland	37,973	312,679	529,029	3,3	46,0	0,855**	8,99
	(7.4)		(3.21)				(3,33)
Romania	19,414	238,390	223,337	3,9	35,2	0,802**	19,06
	(3.78)		(1.36)				(2,43)
Slovenia	2,081	20,273	48,006	4,5	66,1	0,893*	3,69
	(0.41)		(0.29)				(10,01)
Slovakia	5,450	49,035	94,171	5,8	48,0	0,845**	2,78
	(1.06)		(0.57)				(9,85)

Sources: Population - Eurostat [demo_pjan] in thousand inhabitants in 2019 (in brackets % EU-28); Area - Eurostat [demo_r_d3area] square kilometers in 2015; GDP - Eurostat [nama_10_gdp] Gross Domesic Product in current prices in millions Euros in 2019 (in brackets % EU-28); Unemployment rate - Eurostat [une_rt_a] percentage of the labour force (15-74yo) 2019; Public debt - Eurostat [gov_10dd_edpt1] government consolidated gross debt (% GDP) 2019; HDI - UNDP Human development index, *2018 (very high) **2015(very high) ***2015 high (Bulgaria); Agriculture - Eurostat [lfsa_egan2] Share of total employment in agriculture (NACE A) 2019 in brackets, percentage of total utilized agriculture area dedicated to organic crop (Eurostat: [org_cropar]) 2018

Figure 1.6 – Trade inside EU-28
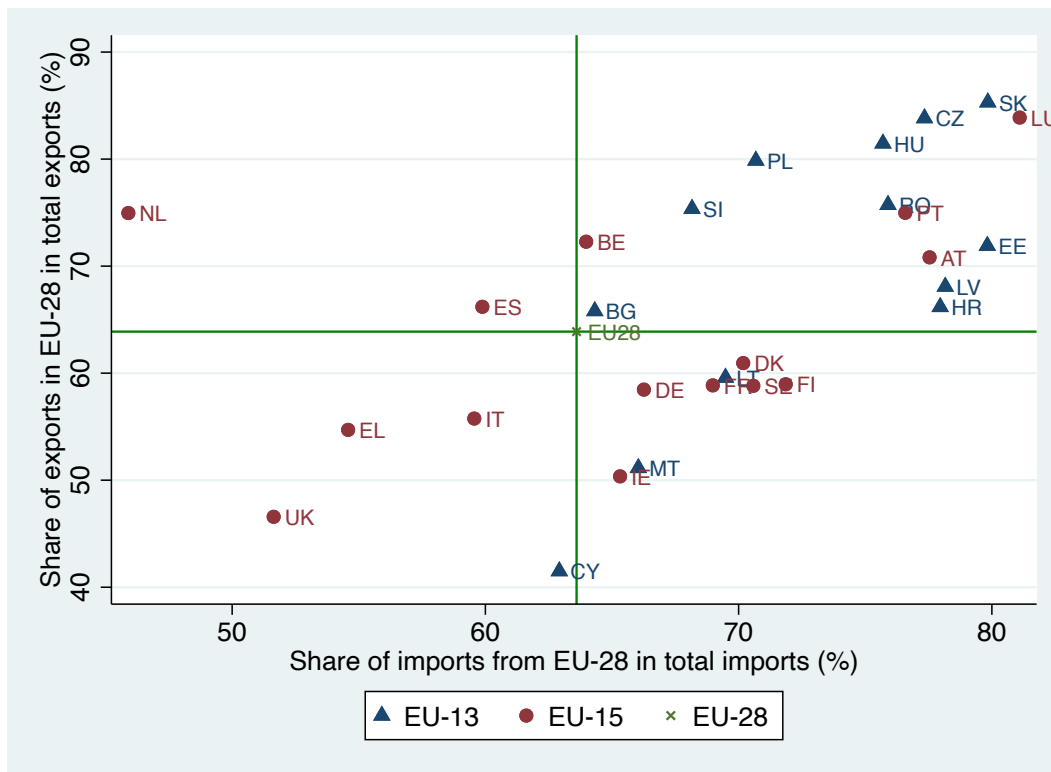
Source: Eurostat [ext_lt_intratrd]

Notes: The graph 1.6 underlies the importance of trade within the EU-28 in the CEECs (average data from 2014 to last data available).

Figure 1.7 – Nominal convergence: Bond yields
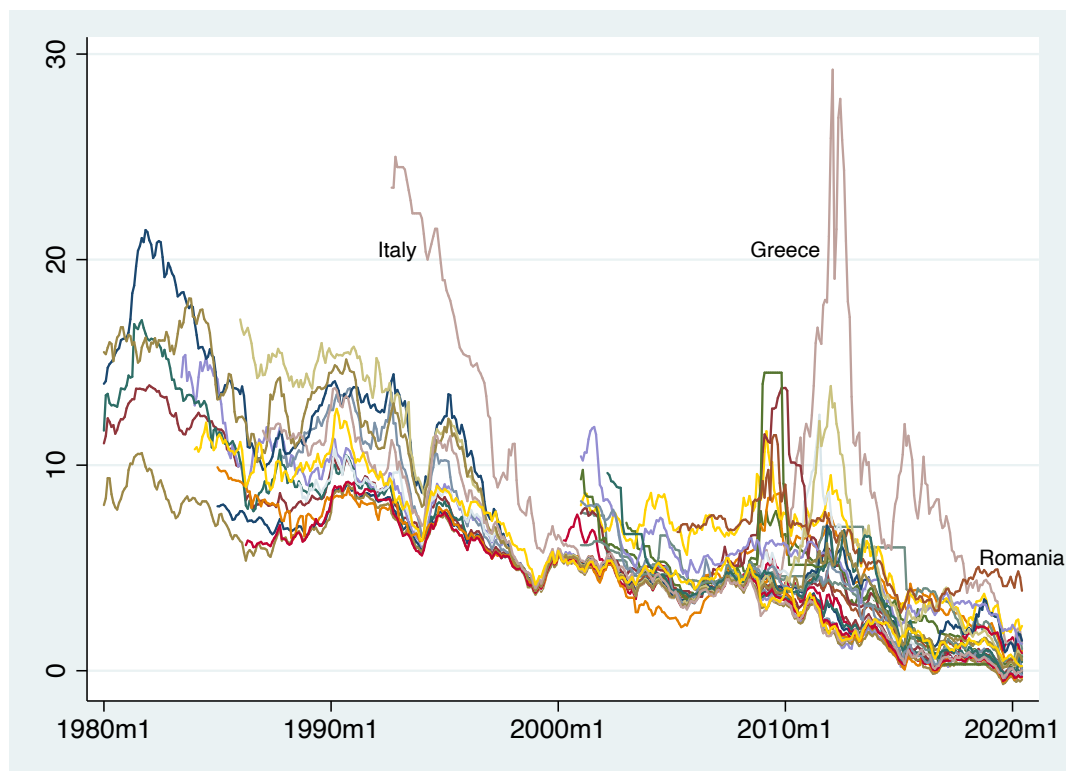
Source: Eurostat [irt_lt_mcby_m];
Notes: The graph 1.7 traces the EMU convergence criterion bond yields (in %) over the last forty year.

(a) Price adjustment

(b) Quantity adjustment
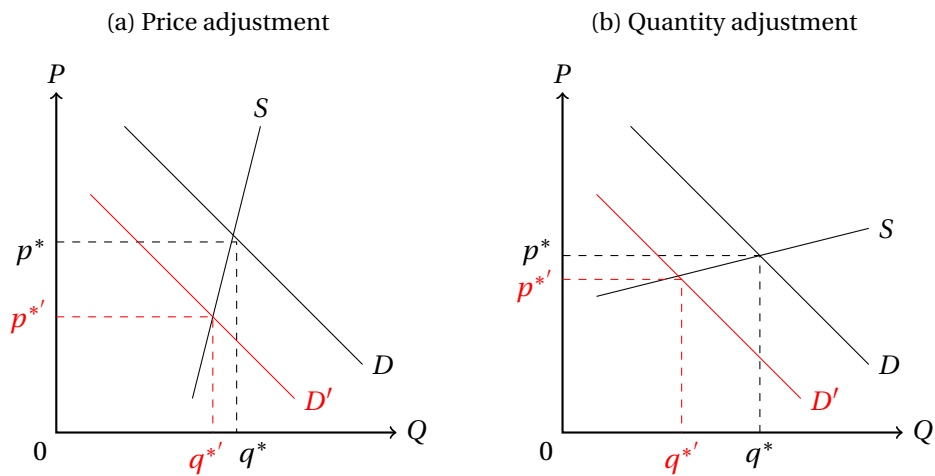
Figure 1.8 – Labour supply adjustments

Notes: These two diagrams present the different adjustment mechanisms of the labour supply, following a shock on the labour demand, given heterogeneity in the labour supply wage elasticity. On the left diagram, labour supply mainly adjust through price while in the right diagram, most of the adjustment is made through quantity. This static snapshot allows to understand the intuition behind the dynamic model à la Blanchard et al. (1992) we use in chapter 4.

1.B   A global European context

Visegrad group

Czech Republic, Hungary, Poland and Slovakia form the Visegrad Group ('V4'). Built in 1991, the V4 brings together countries of the Central European region with common cultural and intellectual values they wish to strengthen. Based on optimum cooperation and on the idea of fostering the EU integration process, they reached in 2004, the V4 promote the democratic development in all parts of Europe. The V4 is particularly active in the field of education, culture, environment and science.

In itself, the V4 is not institutionalized but is based on regular meetings of the V4 prime ministers. Since 2000, the International Visegrad Fund has been supporting non-governmental organizations, individual scholarships and artist residencies, contributing to the V4 cooperation. The idea of such a cooperation is not new in the region and goes back to the XIV century. The main purpose of re-activating this congress is to eliminate remnants of the communist bloc in Central Europe and to put a final mark to historical animosities in the region. The concept of a better cooperation to initiate a durable and sustainable period of peace, refers to the EU foundation and highlight the idea of a joint efforts to achieve a common goal.

The first period of the V4 were highly turned toward cooperation in the military and defence context both in terms of joint development of the V4 armed forces and the defence industry. But with the NATO and EU integration, the prevalence of the defence has been upstaged but not abandoned. Indeed, the Euro-Atlantic security and the 2010 NATO Strategic Concept induced the Visegrad defence cooperation to consider a new direction. In 2014, the V4 Prime Ministers signed the Budapest Declaration of the Visegrad Group Heads of Government on the New Opening in V4 Defence Cooperation aim at strengthening the V4 defence industries (R&D and production), proposing the common development project of universal modular tracked platform and a permanent V4 modular force.

Besides the defence project, the V4 plays a strong role in foreign affairs, particularly in the context of the EU and NATO and also focus on issues like border cooperation and immigration affairs to fight illegal migration, illicit drugs transport, organised crime and terrorism. In terms of society, the V4 implements different programs to promote culture, art and sport. It also engages in environmental issues with project for sustainable development, questions related to boundary waters and flood prevention and safety issues concerning nuclear energy.

The Visegrad countries represents, for other reforming states, a positive example and an attractive model of economic and social transformation particularly important in the EU context. Initially created to promote the cooperation and coordination to fulfil the EU and

NATO integration requirements, the V4 successfully moved to the promotion of common positions without being an alternative of the EU. Since they enter the EU in 2004, V4 countries always support Western Balkans economies in their integration into the EU.

During the last years, the V4 advocates for a strong Europe, particularly for the Cohesion Policy and the Common Agricultural Policy. The relatively weaker transport network is also at stake to ensure the competitiveness of the region as the V4 still attract 76% (2017) of FDI from EU-28 to Eastern European countries.

The political and diplomatic cooperation, ensuing the common political agenda concerning the EU integration is still playing a strong role for the EU council as the weight of Visegrad votes equals that of Germany and France. This counterweight should not be viewed as a political opposition since long-term objectives of the V4 are usually shared by EU Member States. Moreover, Poland, the most powerful member of the V4 also belong to the Weimar Triangle and so has developed strong inter-countries linkages with France and Germany (see box The Weimar Triangle).

Box: The Weimar Triangle

The Weimar triangle, founded in 1991 is a trilateral informal cooperation between France, Germany and Poland. This forum has two main fields of action. The first one is political, through consultation between the three countries. The second one, more societal, refers to existing links between the citizens of the three States.

In 1991, the Weimar Triangle acts to favour the entry of Poland in EU and NATO (target reach in 2004). It is also a tool to promote peace-building between Germany and Poland as had been initiated at the very beginning of the EU between France and Germany. The Weimar Triangle is criticized upon its lack of efficiency, nevertheless the first goal is to install a dialogue between these three countries who represent in 2017 almost 40% of both the EU-28 population and the EU-28 GDP. Since the beginning discussions are mostly concerning geopolitical issues on fields like energy or foreign affairs. As Poland joined the EU in 2004, the Weimar Triangle turned toward upstream consultative work on European negotiation.

Besides its role within the EU, the V4 benefits from its central geographical position to promote the dialogue between the neighbours from Europe and European neighbours such as Armenia, Moldovia or Ukraine.

The main success of the V4 lay on the exclusion of bilateral tensions and the increasing impact of V4 presidencies. Further developments are expected with EU Eastern partnership and

V4+ mechanism to enable cooperation with countries outside V4 without denying the "No Enlargment" rule.

EU regional concerns: the cohesion policy

Since Croatia entered the European Union, in 2013, 281 regions[28] interact together to stem disparities and to reduce social and economic development gap. Back to the seventies (EU enlargement & the oil shocks) and the eighties (Single European Act, 1988), the importance of focusing on the regional development has always been one of the main concerns of the EU[29]. Regional EU budget, commonly named "cohesion policy", aims at focusing on regional disparities to make sure that, with local institutions involvement, every EU citizen, wherever she lives, may participate and enjoy the benefit from the common market EC (2008).

The importance of looking at the regional development is still an issue among the CEECs. Their rapid economic development should not be done at the expense of an increasing level of inequalities. Recent OECD works reveals a wide dispersion in employment with uneven regional growth for example in Hungary (OECD, 2019b) or in Latvia (OECD, 2019a) and the subsequent role of internal mobility and education to foster regional economic convergence. The keystone of cohesion policy is to engaged local administration to strengthen economic and social cohesion under the "additionality" rule to avoid substitution effect between states and EU development funds. This last point means that EU funds may end up with increasing states local expenses. In 1994, following the last enlargements (Greece [1981], Spain & Portugal [1986]), cohesion policy captures almost a third of the total EU budget. To distribute EU funds, the European Commission order regions following their level of economic development. The most developed regions have a per capita GDP higher than 90% of the EU average, less developed regions are below 75%. Intermediary regions are in-between. Planned over a seven-year framework, the last cohesion policy, 2014-2020, with an initial budget of 351,5 billion Euros, aims at supporting growth and employment, fighting climate change and energy dependency and last struggling social exclusion.

The 2021-2027 cohesion policy will focus on a smarter, greener and connected Europe while recentring toward the social dimension of the EU project. It also strongly simplifies rules, increase communication and integrate new elements besides the per capita GDP to determine budget regional allocation.

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[28]Regions correspond to the NUTS-2 Eurostat classification (the new 2021 classification will count for 283 NUTS-2 regions. For more details on the NUTS classification, please refer to Eurostat website: https://ec.europa.eu/eurostat/web/nuts/background

[29]The Roma treaty (1957) poses the ground of a harmonious development, reducing gaps with laggard regions but do not specifically mention the regional dimension relevance

The Banking Union

Next to the 2008 financial crisis, the European institutions went through initiatives to secure the European financial sector (EC, 2020). All EU actors (i.e., every member states) engaged toward stronger prudential requirements for banks, improvement of the protection for depositors and implementation of new rules for managing failing banks. This is the banking union leitmotiv. The banking supervision aims at improving transparency and safety market for banks (EBF, 2019) thanks to applying common rules under administrative standards for supervision.

To give a tangible power to the banking union, three mechanisms, namely the single supervisory mechanism (SSM), the single resolution mechanism (SRM) and the European deposit insurance scheme (EDIS) have been put in place.

The SSM gives authority to the ECB over certain supervisory tasks concerning the financial sector (ECB, 2020). The largest banks are under the ECB supervision while the other banks are supervised at the national level with closed links with the ECB (EC, 2020). Besides the SSM, the SRM implements specific process in case of failing banks (or likely to fail). The SRM, with the single resolution board, aims at reducing financial instability and avoiding bank failure to strongly affect the broader economy. Closed to both previous mechanisms, the EDIS, in case of banks insolvency or in resolution, protects deposits in the Euro area. It progressively aims at reducing national deposit guarantee schemes vulnerability. The strength of EDIS is to separate financial issues of banks from the countries they are located in.

1.C Headline EU-2020 indicators

EU-2020, a word on...

Employment

The employment chapter of the EU-2020 strategy is anchored on a dual issue, referring to both demographic challenges and labour demand changes. The last two decades demographic changes ended with a higher share of older people. This has led to putting the European social model sustainability at risk. The EU 2020 strategy plays a key role in this ageing context and the rising global competition. Indeed, the full use of the EU labour potential will strengthen the EU inclusive growth priority thanks to high quality jobs creation. Employment targets, interlinked with all other EU-2020 strategy goals, cannot be achieved without dealing with

stronger investment in new technologies (R&D) and the promotion of a better educated labour force (Education target). The employment rate is on an upward trend, reaching 73,2% in 2018 but being unevenly distributed among the population. Younger and closed-to retirement working age population both suffer from the lowest employment rates. Despite a decreasing gender gap (11,8 pp in 2018 for the 25 to 49yo), women employment is still an issue in EU, partly explained by family and caring responsibilities and weak financial incentives in tax-benefit systems to re-enter the labour market. An efficient employment leverage effect is observed through the educational attainment level. Unsurprisingly, the highest employment rate concerns tertiary educated graduates (84,5% in 2018). In the context of a shrinking labour force, increasing immigration is a non-negligible asset that may reduce the negative impact by 50% by 2060, according to EU population projections. However, migrants do not benefit from an efficient labour market integration, mostly working in insecure position and poor working condition. Besides the European demographic challenge, the 2018 EU's countries employment policies guidelines recall the importance of boosting the labour demand and enhancing the labour supply by improving access to employment, skills and competences while promoting an effective social dialogue and fostering social inclusion.

Policies are needed to help workers and entrepreneurs prepare for and adapt to technological changes. Indeed, the fast improvement in the quality of capital needs labour to adjust while more flexible organisation of the production process brings about diversity in forms of work. Estimated share of automatable jobs due to technological improvement (share of fully automatable jobs 42,5%) point to a high likelihood of extensive substitution of capital for labour and an increase in capital-labour complementarity. Investments toward more capital are driven by the substitution effect but also by the upgraded human capital. Higher-skilled labour force turns out to be capital-complementary, valuing more innovative technologies. Such that a priority for the EU is to ensure education and training to be in line with labour market changes.

Research and Development

Research and Development expenditure (R&D) expenditure in the EU stood at 2.06 % of GDP in 2017, with a target at 3% in 2020. The business enterprise sector is the largest R&D performing sector in the EU, accounting for 66% of total R&D expenditure, followed by the higher education and government sectors contributing respectively to 22% and 11%. Countries heterogeneity mostly reflect differences in industrial structures but underline, over the last decade a convergence of eastern and southern European countries toward western Europe standards. Geographical concentration of R&D in clusters, supported by a strong academic

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institution and/or high-technology industries, usually end-up in a virtuous circle attracting new start-ups.

Climate change

As a contribution to slowdown the global warning, the EU engaged in a drastic reduction (20%) of the greenhouse emissions with an objective of becoming a low-carbon economy defined in the 2030 targets of 40 percent compared with the 1990 levels. The final goal is to establish a net-zero emission levels by 2050.

In line with the greenhouse gas emission reduction, the Member States have to increase their share of renewable energy sources on the gross final energy consumption i.e., the energy supplied to final consumer. Despite different schemes of available natural resources, such as the possibility of building hydropower plants, all EU countries reached a higher use of renewable energy in final energy consumption over the last decade. Recent analysis pointed out the necessity for most of the countries to strengthen the implemented policies to boost the decreasing trend if they want to rich the own specific targets by 2020.

Poverty and social exclusion

Poverty and social exclusion may be seen as a downward spiral affecting health and well-being, lowering educational outcomes and reducing employability. This scheme leads to a persistent poverty, creating more inequality and in the long-term a non-negligible impact on economic productivity. In the context of inclusive growth, the EU-2020 strategy aims at reducing the number of people at-risk of poverty. In 2017, roughly a five of the population were at risk of poverty or social exclusion, experiencing at least one of the three form of poverty (monetary poverty, severe material deprivation or very low work intensity). Two channels are at stake to positively reduce the negative impact of poverty and social exclusion. Social transfers reduce the poverty prevalence. In 2017, social transfers decreased the risk of monetary poverty for people suffering from some or severe activity limitations by 47 percentage points. To avoid poverty to pass on from one generation to the next, effective education, health, social, tax-benefit and employment systems are the most efficient approach. This is particularly true to targets vulnerable population.

Identifying groups with a heightened risk of poverty or social exclusion, and determining the reasons behind this vulnerability, is the key to creating sound policies to fight poverty. The most affected are women (23.3% in 2017), children, young people, people with disabilities (36%), the unemployed, single- parent households (47%) and those living alone, people with

lower educational attainment (34,3%), people born in a different country than the one they reside in (38,3%), people out of work, and, in a majority of Member States, those living in rural areas (23,9%).

An important aspect to consider when analysing the overall number of people at risk of poverty or social exclusion is the transmission of disadvantage from one generation to the next. According to the report on 'Employment and Social Developments in Europe' (2018), children whose parents have low educational background are 47 percent less likely to be employed as opposed to unemployed or inactive; those children are also ten times less likely to high-educated compared to children of high-educated parents.

Scoreboard

Table 1.2 – EU-2020 strategy headline indicators: scoreboard

Indicator	2008	2018	Target
Employment rate - age group 20-64 (% of population aged 20-64)	70.2	73.9*	75
Gross domestic expenditure on R&D (% of GDP)	1.83	2.12	3
Greenhouse gas emission (Index 1990=100)	91	76.76	80
Share of renewable energy in gross final energy consumption (%)	11.368	17.977	20
Primary energy consumption (million tonnes of oil equivalent)	1700.93	1551.92	1483
Final energy consumption (million tonnes of oil equivalent)	1184.78	1124.14	1086
Early leavers from education and training (% of population aged 18-24)	14.7	10.3*	10
Tertiary educational attainment	31.1	38.7*	40
People at risk of poverty or social exclusion (cumulative difference from 2008 in thousand)	(-)	-7521	-20000

Notes: * Figure refers to year 2019; last update August 2020

Source: Eurostat headline indicators scoreboard web-page

National EU-2020 targets

Europe 2020 Targets

EU/Member State	Employment rate	Gross domestic expenditure on research and development	Greenhouse gas emissions	Share of renewable energy	Energy efficiency	Early leavers from education and training	Tertiary educational attainment	Poverty and social exclusion
EU-28	Increasing the employment rate of the population aged 20-64 to at least 75%	Increasing combined public and private investment in R&D to 3% of GDP	Reducing greenhouse gas emissions by at least 20% compared to 1990 levels	Increasing the share of renewable energy in final energy consumption to 20%,	Moving towards a 20% increase in energy efficiency (equalling a reduction to 1 483 Mtoe of primary energy consumption)	Reducing school drop-out rates to less than 10% (of the population aged 18 to 24)	Increasing the share of the population aged 30-34 having completed tertiary education to at least 40%	Lifting at least 20 million people out of the risk of poverty and social exclusion (compared to 2008)*
Belgium	73.2 %	3 %	- 15 %	13 %	43.7	9.5 %	47 %	- 380 000 persons
Bulgaria	76 %	1.5 %	+ 20 %	16 %	16.9	11 %	36 %	Reduce by 260 000 the number of persons living in monetary poverty
Czech Republic	75 %	1 % (public sector only)	+ 9 %	13 %	39.6	5.5 %	32 %	- 100 000 persons
Denmark	80 %	3 %	- 20 %	30 %	17.8	10 %	> 40 %	Reduce by 22 000 the number of persons living in households with very low work intensity
Germany	77 %	3 %	- 14 %	18 %	276.6	< 10 %	42 % (ISCED 2011 level 4-8)	Reduce by 20 % the number of long-term unemployed (unemployed for more than one year) compared to 2008. (equalling to a reduction of 320 000 longterm unemployed persons)
Estonia	76 %	3 %	+ 11 %	25 %	6.5	9.5 %	40 %	Reduce to a rate of 15 % the number of persons living at risk of poverty after social transfers (compared to 17.5 % in 2010)
Ireland	69 - 71 %	2.5 % of GNP (Approximately 2 % of GDP)	- 20%	16 %	13.9	8 %	60 %	Reduce by a minimum of 200 000 the population in combined poverty (either consistent poverty, at-risk-of-poverty or basic deprivation).
Greece	70 %	1.2 %	- 4 %	18 %	24.7	<10 %	32 %	- 450 000 persons
Spain	74 %	2 %	- 10 %	20 %	119.8	15 %	44 %	- 1 400 000 to - 1 500 000 persons
France	75 %	3 %	- 14 %	23 %	219.9	9.5 %	50 % (age group 17 to 33)	- 1 900 000 persons (compared to 2007)
Croatia	62.9 %	1.4 %	+ 11 %	20 %	11.5	4 %	35 %	Reduce to 1 220 000 the number of persons at risk of poverty or social exclusion .
Italy	67 - 69 %	1.53 %	- 13 %	17 %	158.0	16 %	26 - 27 %	- 2 200 000 persons

EU/Member State	Employment rate	Gross domestic expenditure on research and development	Greenhouse gas emissions	Share of renewable energy	Energy efficiency	Early leavers from education and training	Tertiary educational attainment	Poverty and social exclusion
Cyprus	75 - 77 %	0.5 %	- 5 %	13 %	2.2	10 %	46 %	- 27 000 persons or reduce the rate to 19.3 % of the population (compared to 23.3 % in 2008)
Latvia	73 %	1.5 %	+ 17 %	40 %	5.4	10 %	34 - 36 %	Reduce by 121 000 the number of persons living at risk of poverty after social transfers and/or in households with very low work intensity
Lithuania	72.8 %	1.9 %	+ 15 %	23 %	6.5	< 9 %	48.7 %	- 170 000 persons and limit to 814 000 persons in 2020
Luxembourg	73 %	2.3 - 2.6 %	- 20 %	11 %	4.5	< 10 %	66 %	- 6 000 persons
Hungary	75 %	1.8 %	+ 10 %	13 %	24.1	10 %	34 %	- 450 000 persons
Malta	70 %	2 %	+ 5 %	10 %	0.7	10 %	33 %	- 6 560 persons
Netherlands	80 %	2.5 %	- 16 %	14 %	60.7	8 %	> 40 %	Reduce by 100 000 the number of persons (aged 0-64) living in a jobless household (compared to 2008)
Austria	77 %	3.76 %	- 16 %	34 %	31.5	9.5 %	38 %	- 235 000 persons
Poland	71 %	1.7 %	+ 14 %	15 %	96.4	4.5 %	45 %	-1 500 000 persons
Portugal	75 %	2.7 - 3.3 %	+ 1 %	31 %	22.5	10 %	40 %	- 200 000 persons
Romania	70 %	2 %	+ 19 %	24 %	43.0	11.3 %	26.7 %	- 580 000 persons
Slovenia	75 %	3 %	+ 4 %	25 %	7.3	5 %	40 %	- 40 000 persons
Slovakia	72 %	1.2 %	+ 13 %	14 %	16.4	6 %	40 %	Reduce to a rate of 17.2 % the number of persons living in poverty or social exclusion (compared to 20.6 % in 2008)
Finland	78 %	4 %	- 16 %	38 %	35.9	8 %	42 % (excluding former tertiary Vocational Education and Training (VET))	Reduce to 770 000 the number of persons living in poverty or social exclusion
Sweden	> 80 %	4 %	- 17 %	49 %	43.4	< 7 %	45 - 50 %	Reduce to well below 14 the percentage of women and men (aged 20-64) who are not in the labour force (except full-time students), long-term unemployed or on long-term sick leave
United Kingdom	No target in National Reform Programme	No target in National Reform Programme	- 16 %	15 %	177.6	No target in National Reform Programme	No target in National Reform Programme	No target in National Reform programme, but numerical targets exist under the umbrella of the 2010 Child Poverty Act and the Child Poverty Strategy 2011-2014

EU/Member State	Employment rate	Gross domestic expenditure on research and development	Greenhouse gas emissions	Share of renewable energy	Energy efficiency	Early leavers from education and training	Tertiary educational attainment	Poverty and social exclusion
Source of information and comments	EU target as set out in European Commission. Taking stock of the Europe 2020 strategy for smart, sustainable and inclusive growth, COM(2014) 130 final, Brussels, 2014 (p. 12). National targets as set out in the most recent National Reform Programmes. The definitions of the national targets are comparable to the EU target.	EU target as set out in European Commission, Taking stock of the Europe 2020 strategy for smart, sustainable and inclusive growth, COM(2014) 130 final, Brussels, 2014 (p. 12). National targets as set out in the most recent National Reform Programmes. The definitions of the national targets are comparable to EU target except for Czech Republic and Ireland (see country specific remarks).	EU target as set out in European Commission, Taking stock of the Europe 2020 strategy for smart, sustainable and inclusive growth, COM(2014) 130 final, Brussels, 2014 (p. 12). Binding national targets for GHG emissions from sectors not included in the EU Emissions T rading System (EU ETS) are set out in the **Effort Sharing Decision** (Council Decision 406/2009/EC: Annex II). The binding national targets refer to the Effort Sharing Decision base year 2005.	EU target as set out in European Commission, Taking stock of the Europe 2020 strategy for smart, sustainable and inclusive growth, COM(2014) 130 final, Brussels, 2014 (p. 12). Binding national targets are set out in the **Renewable Energy Directive** (Directive 2009/28/EC: Annex I). For some MS the national targets as set out in the most recent National Reform Programmes may be more ambitious than defined in annex I of the Renewable Energy Directive.	EU target as set out in European Commission, Taking stock of the Europe 2020 strategy for smart, sustainable and inclusive growth, COM(2014) 130 final, Brussels, 2014 (p. 12) and in article 3 of the **Energy Efficiency Directive** (Directive 2012/27/EU and Directive 2013/12/EU) . As required in the Energy Efficiency Directive, MS set out indicative national energy efficiency targets based on primary or final energy consumption, primary or final energy savings, or energy intensity. They were 'translated' into Mtoe of **primary energy consumption** and may differ from target values mentioned in the most recent National Reform Programmes.	EU target as set out in European Commission, Taking stock of the Europe 2020 strategy for smart, sustainable and inclusive growth, COM(2014) 130 final, Brussels, 2014 (p. 13). National targets as set out in the most recent National Reform Programmes. The definitions of the national targets are comparable to the EU target.	EU target as set out in European Commission, Taking stock of the Europe 2020 strategy for smart, sustainable and inclusive growth, COM(2014) 130 final, Brussels, 2014 (p. 13). Indicator for the EU target refers to ISCED1997 level 5-6 (data up to 2013) respectively to ISCED 2011 level 5-8 (data 2014 onwards) National targets as set out in the most recent National Reform Programmes. The definitions of the national targets are comparable to the EU target except for Germany, France and Finland (see country specific remarks).	EU target as set out in European Commission, Taking stock of the Europe 2020 strategy for smart, sustainable and inclusive growth, COM(2014) 130 final, Brussels, 2014 (p. 14). At risk of poverty or social exclusion, abbreviated as AROPSE, refers to the situation of people either at risk of monetary poverty or severely materially deprived or living in a household with a very low work intensity. The total number of people at risk of poverty or social exclusion is lower than the sum of the numbers of people in each of the three forms of poverty or social exclusion as some persons are affected simultaneously by more than one of these situations. * 2008 is taken as a baseline year because a large part of the social indicators to measure the three dimensions of poverty are only available starting from 2008. Monitoring refers to EU-27 as Croatia joined EU in 2013 and data is only available starting from 2010. National targets as set out in the most recent National Reform Programmes. The definitions of the national targets are comparable to the EU target except for Bulgaria, Denmark, Germany, Estonia, Ireland, Latvia, Netherlands and Sweden (see country specific remarks). The calculation of the target values differs from the calculation of the EU target value for Estonia, France, Croatia, Slovakia, Finland and Sweden (see country specific remarks).

2 External monetary shocks to CEECs

This chapter has been presented during the 67th *AFSE annual meeting, Paris (PSE) in 2018 and in Doctoriales du développement in Orléans (LEO) in 2016.*

2.1 Introduction

Until they enter the EMU, the six remaining EU economies, still on the verge of the Euro area, face a challenging situation. They are part of the European System of Central Banks but hold their monetary autonomy. This is particularly the case for Czech Republic, Hungary, Poland and Romania, who choose flexible exchange rate regime.[1] Entering the European Union is conditioned to the EA accession and so engage governments to fulfil, at least in the middle term, EMU economic requirements.

The inter-dependency increase, between EU economies, raises the question of the ECB monetary impacts on the EU non-Euro members. This paper tends to bring some new insights, on the extent to which the ECB decision drive real economy changes, among the CEECs and how the domestic monetary policy adapts, to both implement a national strategy and to respond to the EU and the ECB framework.

Up to now, ECB policy do not explicitly consider the specific characteristics of the CEECs as they are not yet part of the EA.[2] The goal of this paper is to deal with the ECB monetary policy

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[1] Except for Hungary, who choose crawling peg regime (but with huge bands $(+/-15\%)$) until 2008, the previously mentioned economies adopted inflation targeting strategy (last adoption by Poland in 1998) with the subsequent floating exchange rate regime. In the EU context, with the free capital movement requirement, inflation targeting strategy implies a flexible exchange rate to keep monetary policy independence. On the other side, both Bulgaria and Croatia anchored their currency to the Euro, respectively thanks to a currency board and a crawling peg regime (more on exchange rate regimes in emerging Europe in Belhocine et al. (2016).

[2] This last point refers to the international monetary coordination debate.

impacts on CEECs.

The paper follows the idea from Rey (2015) who suggested a dilemma instead of a trilemma to investigate the importance of the monetary policy. We complete previous work from Jarociński (2010) on monetary spillovers toward the CEECs and from , Babecká Kucharčuková et al. (2016) on the importance of considering the unconventional monetary policy, using a measure for unconventional instrument, from the ECB, to disentangle the ZLB strategy. Moreover, we opt for a panel approach, to capture the average overall effect of the spillovers and propose a deeper analysis of the exchange rate regime heterogeneity in the CEECs upon the domestic variables volatility to enrich the debate brought by Hajek and Horvath (2018).

We consider two groups of countries, those which already joined the EMU (plus Bulgaria) and those still on the verge (which have preferred a flexible exchange rate regime). Implementing a panel VAR approach, we disentangle the ECB spillovers to real and nominal variables. We draw a comparison over time and according to the exchange rate regime.[3]

Our results are in line with the recent literature following Rey (2015). A shock, on the ECB monetary policy, is followed in the middle term by changes in the real effective exchange rate, to absorb the shock. We observe some monetary spillovers, toward GDP. After a very short run boom on GDP, following a positive ECB shock, GDP flies back to its long-term trajectory. No clear overall significant result is found on inflation. As expected, the focus on the recent period gets rid of the significant impact on the real economy.

The variance decomposition allows us to confirm that economies under flexible exchange rate regime are more aware of the changes in their inflation to draw their domestic monetary policy. The GDP variance seems to be strongly influenced by the ECB monetary shocks in both floating and pegged countries. However, in a more recent period of time, such a result tends to mitigate. The paper is organized as follows. Section 2.2 proposes a review of the existing literature. Section 2.3 gives some stylized facts. Section 2.4 explains the econometrical approach and the data; then, the rest of the paper is divided in two sections; section 2.6 describes the main results and section 2.7 concludes.

2.2 Literature

Since the recent seminal papers from Rey (2015, 2016), monetary spillovers issue regains of interest (Han and Wei, 2018; Hajek and Horvath, 2018). Spillovers are intrinsically associated to

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[3]A recent work from Ahmed (2021) proposes to use a continuous measure of exchange rate regime to analyse the spillovers according to the degree of flexibility.

the debate concerning the pro and cons of the international monetary coordination (Clarida et al., 2002; Corsetti and Pesenti, 2005; Taylor, 2013). Global factors, driven by worldwide economic centres, directly influence small open economies (Maćkowiak, 2007; Fratzscher et al., 2016). According to Aizenman et al. (2016) and Georgiadis (2016), financial openness and exchange rate stability in "peripheral economies" are of primo interest to understand monetary spillovers level from economic leaders. The importance of capital flows and the intrinsic instability following an international monetary shock has been recently theorized in Plantin and Shin (2018) and tends to support the idea that small changes may induces significant fluctuations in small inflation-targeting economy with flexible exchange rate. Canova (2005) mention the importance of considering financial flows, resulting from foreign change in their policy rates. Indeed, Forbes and Warnock (2012) find, on domestic flows and the subsequent domestic monetary policy, significant impact of the foreign financial flows. Looking at the Fed policy, Bruno and Shin (2015) highlights monetary spillovers and the underlying role of the banking sector, strongly corroborated by Buch et al. (2019) ; and Cetorelli and Goldberg (2012) assess the increasing relevance of the banking sector globalization. Following Anzuini and Levy (2007) financial development, in transition economies, is part of the relatively weaker monetary policy effectiveness. However, Elbourne and de Haan (2006) cannot reject the link between financial structure indicators and domestic monetary policy in the CEECs.

The foreign interest rates are a potential significant channel, affecting the domestic economy (di Giovanni and Shambaugh, 2008; Hofmann and Takats, 2015). However, the recent global economic 2008 crisis push Central Banks toward the zero lower bound situation. Recent studies like Chen et al. (2016) or Tillmann (2016) use quantitative easing measures to draw monetary impacts, driven by the Fed, on emerging countries. They found unconventional monetary spillovers to significantly impact smaller economies.

Looking at the EU, Fratzscher et al. (2016), through the unconventional ECB monetary policy, focus on the financial market and find positive spillovers on both equity markets and confidence in the CEECS. Unconventional policies are found to positively impact output growth and inflation in the CEECs (Horvath and Voslarova, 2017; Moder, 2017). In the EU context, Égert and MacDonald (2008) or Brown and Stix (2015) add the euroization issue in the CEECs, to explain this lower efficiency, as a double side-effect, lowering Central Banking flexibility and increasing the CEECs' ECB policy dependency.

Due to their economic integration with the Euro area, monetary spillovers and particularly international effect from loan changes in the EMU, following a monetary shock, lead to large economic response in the CEECs (Fadejeva et al., 2017). Feldkircher (2015) and Potjagailo (2017) found both significant spillovers from ECB monetary policies, despite heterogeneous

(a) GDP evolution	(b) Inflation	(c) Spreads of interest
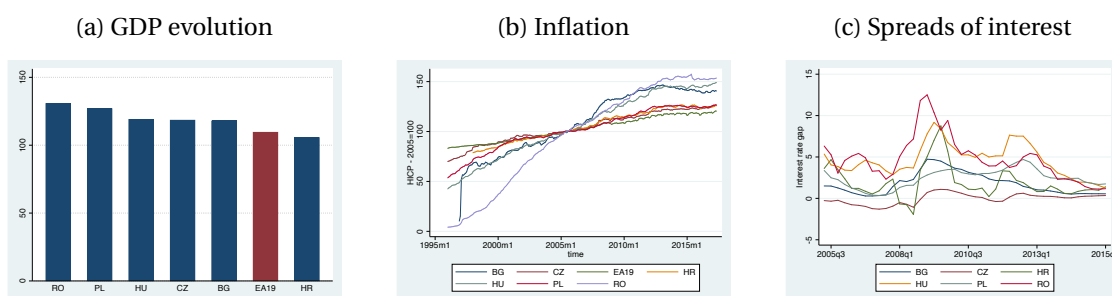
Source: Eurostat [namq_10_gdp]   Source: Eurostat [prc_hicp_midx]   Source: Eurostat [irt_st_q]

Figure 2.1 – Some figures

Notes: The graph 2.1a displays the GDP index in 2017; base 100 in 2010 among the CEECs (EA-19 comparison); . It helps to capture the relatively higher GDP growth rate in the CEECs. The graph 2.1b represent the HICP evolution over the last twenty years. Last, the graph 2.1c presents the interest rate spread between domestic 3-months market rate and the ECB one.

channel depending on trade openness, financial development or exchange rate regime. CEECs response to international shock is found to be stronger than to domestic one (Hájek and Horváth, 2016), confirming the still high relevance of the monetary spillovers debate. To Babecká Kucharčuková et al. (2016), the CEECs reacts to ECB conventional tools to the same extend as the Euro area countries. Unconventional tools lead to heterogeneous results.

2.3 Stylized facts

The GDP index gives an interesting overview of economic growth behaviour in our group of countries. Graph 2.1a provide the index in 2017 (base 100 in 2010). Except from Croatia, the CEECs countries presented here performs better than in the Euro area. The impact of the economic crisis has been pronounced in the CEECs, particularly in Croatia, the index falls from 110 in 2008 to 97 in 2013 and in Bulgaria with kind of a slow recovery process. However, Czech Republic, Hungary and Romania, despite suffering from a break in the series at the beginning of the crisis, quickly returned to their increasing trend. Poland do not exhibit such a break in the GDP index at the time of the 2008 crisis, only a non-persistent slowdown. Between 2010 and 2017, the average annual GDP growth rate reached 1.35% inside the EA. In countries in the verge of the EA, except Croatia (0.55% over the period), the average growth rate stands at 2.57% and pick at 3.3% in Poland.[4]

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[4]Source: Eurostat Gross domestic product at market prices (chain linked volumes, percentage change on previous period) [nama_10_gdp]

The six challenging countries display good results, concerning their inflation rate evolution. Indeed, one institutional challenge, following the liberalization during the nineties, was to fight the high volatility on prices, which was inducing too many uncertainties to enter coherent structural reforms.[5] Inflation trends, since 2005, have been highlighting smoother behaviour, in line with the Euro area (graph 2.1b). However, we should bear in mind economic circumstances during the last two decades. Cheap imports from China, low food and oil prices are part of the improvement in overall inflation changes.

Bulgaria, Croatia and Romania present a faster index increase during the last years. In the case of Romania, for example, domestic reforms, such as changes in VAT rates, as the ones observed in 2013, 2015 and even more recently, in January 2016, must be considered to understand some idiosyncratic behaviours.

Figure (2.1c) highlights the gap decline between the different domestic money market rates compared to the ECB one, associated to kind of a monetary convergence. Such a convergence partly reflects the monetary institution credibility as one of the main targets for the CEECs, in order to justify and implement hereafter the budgetary reforms and their long-term investment programs. A recent work from Levieuge et al. (2018) highlights the negative relationship between the level of credibility and the variance of the interest rate. Furthermore, the authors suggest that credibility is directly linked to monetary efficiency. The ECB and the European System of Central Banks provide a trustful framework to allow monetary stabilization. Looking at data before 2005, interest rate convergence seems particularly impressive in Romania with rates exceeding 30%, to a lesser extend also in Hungary or Poland.

Beside the interest rate evolution, focusing on countries under flexible regime, the exchange rate, against the Euro, decrease, in terms of volatility (graph 2.6 page 74). This is particularly the case in Czech Republic (CZK), to a lesser extend in Poland. In Hungary, the volatility, around the median (see HUF box), slightly decreased over the period nevertheless, we observe an increase in extreme value (polarization).

2.4   Econometric methodology

The commonly empirical approach, to assess the monetary spillovers issue is the use of a country-by-country VAR specification. This approach has been generalized by Sims (1980) and Engle and Granger (1987). Even though, those specifications are useful, it only provides statistical results; strong economic foundations may justify them (Stock and Watson, 2001).

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[5]During the 1996-2000 period, the average annual inflation rate exceeded 10% in Bulgaria (10.65%), Hungary (16.45%) and Romania (54%) and remains particularly high only in Romania until 2005 (Eurostat [prc_hicp_aind].

For Kim and Roubini (2000), VAR model alleviates the price puzzle sometimes found in the empirical international monetary spillovers literature (that is an increase of prices following a monetary contraction which is counter-intuitive according to the monetary policy theory). The panel-VAR approach is particularly interesting as it overcomes usual econometric limitations. The VAR specification, i.e., a dynamic panel model, using a LSDV[6] estimator, provides a powerful identification scheme to deal with both fixed effects issue and endogeneity (Bun and Kiviet, 2006).

As recall by Canova and Ciccarelli (2013), it captures the interdependencies both at a static or dynamic level. It is a useful tool to give some good interpretation of macroeconomic impacts of the monetary policy without modelling the global economy. Despite different observed behaviours in the CEECs, in terms of policy choices, we consider our panel to fulfil the homogeneity hypothesis. In the decade following the end of the communism supremacy, the different strategies, adopted by the CEECs government, do not hamper the homogeneity of the panel. As they entered the EU at the beginning of the 21th century, the CEECs had huge constraints before the accession in terms of political strategies (democracy, stability) and economical perspectives (competition, market economy). Moreover, the CEECs are *de facto* compelled to respect the Maastricht criteria as they also engaged the EMU accession process. The budgetary rules (ratio of public indebtedness, level of deficit) allow us to state kind of a 'common' budgetary framework. Moreover, high weight put by each country, to restore the independence of their Central banks (in their research for international financial credibility) allows us to think monetary policy to not be driven by government short run policy.

Moreover, the panel approach is more interesting, regarding the ECB decision process. The Euro-area is under a single monetary policy. This bar the ECB from implementing country specific decisions. Considering a group of countries allows us to disentangle whether the overall effect is consistent. It so provides an idea of global spillovers without being influenced by country specific characteristics.

As our panel exhibits a medium temporal dimension and a relatively small number of countries, the panel with fixed effect specification (LSDV) is the most appropriated (Bun and Kiviet, 2006) and found to be consistent (Nickell, 1997).

The present model is a k variables panel VAR specification at order q with fixed effects:

$$Y_{it} = Y_{i(t-1)}\Gamma_1 + Y_{i(t-2)}\Gamma_2 + ... + Y_{i(t-q)}\Gamma_{q-1} + \omega_i + \varepsilon_{it} \qquad (2.4.1)$$

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[6]LSDV: Least Square Dummy Variable; in its empirical implementation, we use PVARs from Cagala and Glogowsky (2014).

where

$$i \in \{1, 2, ..., N\} \ \& \ t \in \{1, 2, ..., T_i\}$$

In equation (2.4.1), Y_{it} is a $(1 \times k)$ dimension vector containing all the dependent variables. The right-hand side of the equation includes an individual fixed effects vector and a vector of idiosyncratic errors, respectively denominated as ω_i and ε_{it}. The different $(k \times k)$ dimension Γ matrices represent the parameters of the model to be estimated. Given the usual econometric hypothesis, the error term is supposed to behave in the following way: $E[\varepsilon_{it}] = 0$, $E[\varepsilon_{it}\varepsilon'_{it}] = \sigma$, $E[\varepsilon_{it}\varepsilon'_{ir}] = 0 \ \forall \ r < t$ The equation (2.4.1) in a reduce form:

$$Y_{it} = \Gamma(L)Y_{it} + \omega_i + \varepsilon_{it} \tag{2.4.2}$$

where $\Gamma(L)$ is a matrix polynomial of the lag operator; whereas the other elements remain unchanged. A crucial restriction is imposed in applying the VAR procedure under a panel database. The underlined structure is assumed to be the same for each cross-sectional unit. Fixed effects, introduced as ω_i in the model, bypass this unrealistic assumption on parameters, thanks to the introduction of heterogeneity. Unfortunately, the problem is not entirely solved. The lags of the dependent variables induce regressors to be correlated with those fixed effects such that eliminating the fixed-effects through mean-differencing creates biased coefficients. The 'Helmert procedure' as the one described by Love and Zicchino (2006) solves the inconsistency by using forward mean-differencing. Only the mean of future observations is used to transform the variables. In a formal way, variables are transformed as follow:

$$\tilde{y}^p_{it} = \sqrt{\frac{T_i - t}{T_i - t + 1}} \left(y^p_{it} - \frac{1}{T_i - t} \sum_{r=t+1}^{T_i} y_{ir} \right) \tag{2.4.3}$$

As period differs for each country in the panel, T_i refers to the last available period for country 'i''. This procedure gives more weight to data close to the beginning of the period and no transformation is allowed on the last period as no future observation is available. The same transformation is applied on the error vector; indeed, given the assumptions of neither autocorrelation nor homoscedasticity, the procedure does not alter its characteristics. The following model is obtained:

$$\hat{Y}_{it} = \Gamma(L)\hat{Y}_{it} + \hat{\varepsilon}_{it} \tag{2.4.4}$$

This well-known procedure keeps the orthogonality between lagged regressors and the transformed variables; consistent lagged regressors are introduced as instruments. Instead of referring to the common use of Anderson and Hsiao (1982) and Arellano and Bover (1995)

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methods, estimating the model equation by equation, here the Holtz-Eakin et al. (1988) method is preferred; this last one is a system-based approach. Indeed, it allows strong efficiency gains. To disentangle international spillovers, a first estimation with stationary variables is computed where the vector of endogenous variables is built as:

$$Y_{it} = \left(i_t^{ecb}, \, fx_t, \, \Delta y_{it}, \, \Delta p_{it}, \, i_{it}^{dom} \right) \tag{2.4.5}$$

y refers to the real GDP index, p is the GDP deflator as a proxy of prices, i^{dom} is the real 3-month domestic money market rate, fx is the real effective exchange rate and eventually i^{ecb} is the 3-month maturity EURo Interbank Offered Rate.

The key element in the use of VAR is the possibility to draw the impulse response function (IRF) and the variance decomposition of the error (FEVD). To do so, standard errors of the estimated coefficient are taken into account. The confidence interval set at 95 percent is computed thanks to 500 repetitions of the Monte Carlo simulation. To obtain the IRF, errors have to remain orthogonal; that is a diagonal variance-covariance matrix. The Cholesky decomposition solves such a constraint. Indeed, the use of a specific ordering assumes the variable, in the first position, not to be contemporaneously impacted by the other variables in the model.

We consider the ECB rate as the most exogenous variable, as the CEECs are not part of the ECB board. So, the ECB rate is placed in first position. Then is introduced the exchange rate as it strongly depends on both domestic and international situation. Then we add output and price measures to get the impact on the domestic economy. Last, the domestic interest rate supposes that national banks consider, both the ECB policy and domestic variables to draw their monetary policy. Therefore, the ECB rate may influence contemporaneously the domestic rate but conversely is not true (Clarida et al., 2002). As no strict consensus exists concerning the causal ordering, like Babecká Kucharčuková et al. (2016) we switched output and prices ordering, in robustness, keeping the ECB rate as the most exogenous. Results remain coherent and similar to the main estimation.

2.5   Data and preliminary investigation

To remain coherent with the existing literature and to draw comparison over time with previous studies, commonly used variables are introduced in this model. We use quarterly data[7]

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[7]To control for our results, the model has been implemented, using monthly data (with the year-on-year change in both Industrial Production Index and the core HICP, to consider respectively output and prices); results (figure 2.10 on appendix p.80) are in line with the quarterly specification.

from 1995 to 2019 (depending on data availability) over the different CEECs. Dealing with a panel dimension, under international monetary issue, we restrict our main group to flexible exchange rate countries, i.e., consider only Czech Republic, Hungary, Poland and Romania. Due to data availability Croatia has not been kept in our group of countries.[8]

We use Eurostat database. Table (2.2), in appendix, summarizes each country characteristics. We first consider the three-month money market rate to capture both the domestic and the ECB monetary policies. Reynard (2007) justifies these choices as rates paid on deposits are rigid and change only when there is a persistent change in the interest rate on the market. Moreover, the real 3-months interest rate fits particularly well to the Taylor rule and reflects the credit market stance. To get the real 3-months money market rate, we use the price index as a deflator.

However, dealing with ECB data, it has become a usual approach to include non-conventional measures of the monetary policy, especially when analysing spillovers to the financial market, as the policy rate is closed to zero (Aysan et al., 2015; Takats and Vela, 2014). A recent analysis from Ammer et al. (2016) mentions that spillovers between conventional and non-conventional policies are nearly the same. We opt for the shadow rate, to indirectly count for unconventional policy. The shadow rate follows the method of Wu and Xia (2016) and has been recently used on monetary papers such as Hajek and Horvath (2018). To understand the relative importance of considering unconventional measures on the ECB rates, we present on graph 2.7 page 76, the distribution of respectively the ECB 3-month Euribor versus the shadow rate à la Wu and Xia (2016). Once the ZLB is reached, we observe that the shadow rate is still declining while the Euribor stagnate. The spread increases with the sovereign debt crisis, in 2012.

To capture the exchange rate channel, in our model, we refer to the real effective exchange rate with the 19 EA trading partners, deflated by the consumer price index from Eurostat, expressed in log terms. Then we introduce a measure for GDP, the industrial production index, seasonally and calendar adjusted as well as the GDP deflator to disentangle the international monetary spillovers toward domestic economies. Both last index equal 100 in 2010 and refers to common measure in the literature (Kim, 2001; Gavin and Kemme, 2009).

The variables in the VAR model must be integrated of the same order. To control for it, the Im-Pesaran-Shin (IPS) test has been implemented (Im et al., 2003). This test has been preferred as it release the homogeneity hypothesis. The output measure is transformed to get its year-on-year growth rate, in order to obtain a stationary variable. The price index, as already considered, as the variable growth rate, highlights a stationary behaviour. The ECB rate and

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[8]To draw an interesting comparison, we also wanted to study international monetary spillovers from the ECB to EU candidates. Unfortunately, lack of data does not allow us to construct a robust and pertinent third group.

the domestic rate are kept in level but are de-trended using the Hodrick-Prescott filter (trend stationary process). The table (2.3) sums up the different variables previously introduced with their respective integration order.

The table 2.1 presents the main statistics of our variables among the EU non-Euro countries. The time dimension of our panel decreases as the shadow-rate is not available previous 2004. To some extent, this does not hold a problem. We are interested in recent evolution, of ECB monetary spillovers. The first period after the transition in the CEECs is blurred by structural reforms.

From 2004 to the recent period, we observe, on average, a negative shadow rate. The real

Table 2.1 – Descriptive statistics

Variable	Obs	Mean	SD	Min	Max
ECB shadow rate	220	-0.8	2.77	-5.37	4.15
Exchange rate	252	4.56	0.06	4.36	4.74
Output growth rate	216	3.81	6.36	-25.15	13.32
Price index change	252	3.54	3.47	-2.2	17.1
Domestic monetary rate	252	0.34	3.15	-9.07	10.03

Notes: The ECB rate refers to the shadow rate, the exchange rate is the real effective exchange rate with the EA-19 partners, deflated by the price index. The output growth rate is the year-on-year change in the GDP index. Prices are measured via the price index as an implicit deflator. Last the domestic monetary rate refers to the 3-months money market rate, deflated by the price index.

effective exchange rate (in log terms) is relatively stable over the period, looking at the period after 2010, do not exhibit significant change in the distribution. The highest output increase is observed in Poland (4.9% per year on average). Czech Republic and Hungary suffered the relatively stronger shocks during the 2008 downturn (the minimum in the year-on-year GDP index change is observed in those two countries. The rate of change in the price index was on average around 3.5%, on a year-on-year basis, slightly higher in Romania (6.8%).

Before running the model, we have to determine the number of lags to be introduced. The lag order has been chosen according to the minimization of the Hannan-Quinn criteria. Indeed, following Ivanov and Kilian (2005), the HQ criteria fits better when dealing with monthly and quarterly data. Dealing with quarterly data we introduce two to a maximum of four lags in our model. The lag change order is used as a robustness. Our following results introduce two lags (as suggested by the Hannan-Quinn criteria); up to four lags, the results remain coherent but loose significant impact.

2.6 Results

2.6.1 The impulse response functions

We first focus on the impulse response, up to thirty periods (7.5 years), of the four endogenous variables, after the simulation of a positive shock on the ECB rate (a one standard deviation shock). The positive impulse corresponds to a monetary policy contraction. The first esti-

(a) Shadow rate	(b) Real effective exchange rate	(c) IPI growth rate

(d) Price index		(e) Domestic 3-month rate
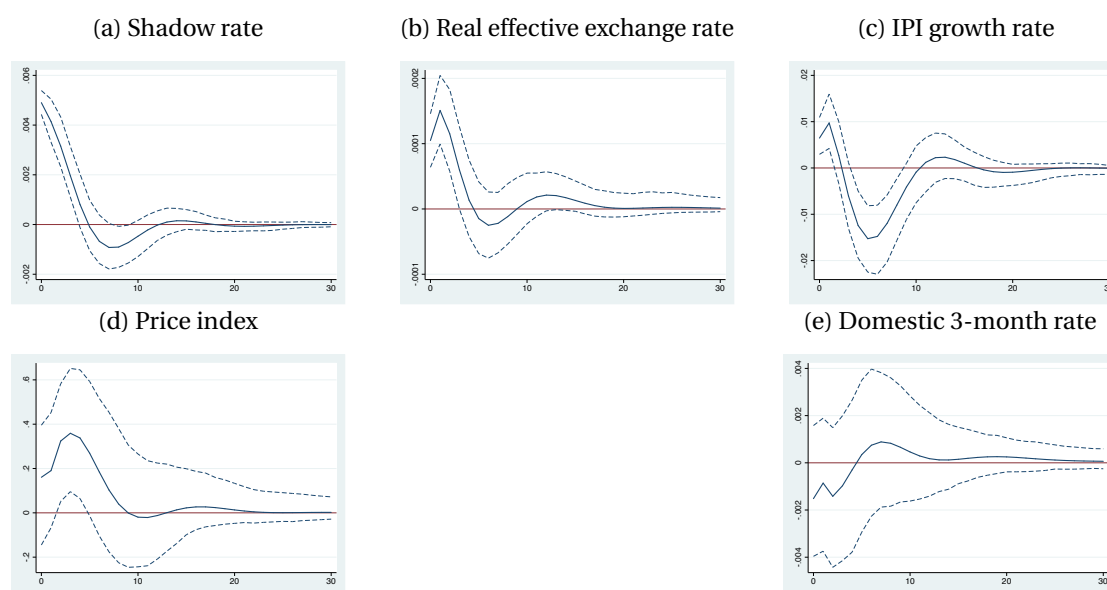
Figure 2.2 – IRFs following a shock on the ECB rate

Note: The solid lines are the impulse response functions whereas, the dashed one represent the 95 percent confidence interval; Errors are generated with 500 repetitions of Monte Carlo simulation. We impose a one standard deviation shock on the shadow rate and observe the response, over thirty periods, of the different variables among flexible exchange rate countries.

mation, figure (2.2), considers the panel of flexible exchange rate regime economies, namely Czech Republic, Hungary, Poland and Romania, on the overall period (i.e., due to data availability, this corresponds to the 2004-2018 period). We find the real effective exchange rate, (graph 2.2b) to quickly absorb the shock (within less than a year). The significant reaction, of the REER, highlights the relative importance of ECB monetary spillovers, toward international trade, for the EU non-Euro countries. The subsequent consequences, on real economy, through international price competitiveness, may engender significant impact on output, in countries, strongly relying on international trade (even more inside the EU-28).

From the output perspective (graph 2.2c), after a brief positive hike in the IPI growth rate, we observe a negative outcome. The significant reaction of the IPI growth rate disappears after 2-3 years. The initial positive impact is not puzzling, as has been already found in the literature (Minea and Rault, 2011) and can be interpreted as even more integrated economies in the EU. Agents anticipate a future increase, in their domestic rates, as their monetary policy goes closed to the ECB one. This positive, very short run, differential on interest rates favours the domestic one, inducing investment to increase and so the GDP. Then the output measure goes back to its long-term trajectory. The negative reaction, following this first impact, converge to the idea that a monetary contraction in the EA have an impact on domestic economy. These first results corroborate some other empirical studies, highlighting a significant, persistent and sufficiently wide effect, to be taken into consideration (Clarida et al., 2002; Gavin and Kemme, 2009; Hajek and Horvath, 2018).

We observe an almost not significant price puzzle, at the beginning of the period. This has been already found by Jarociński (2010). The price puzzle quickly disappears. Different ways to deal with price puzzles are studied in the literature, such as considering a different lag order or using another measure as a proxy for prices.[9] The overall lack of reaction on domestic prices may be explained, by an "aggressive" policy mix, against inflation, as previously mentioned (graph 2.1b). Indeed, structural policies, concerning the high prices volatility, combined with the inflation targeting strategy, may smooth the impact of external monetary shocks, on inflation.

The domestic rate does not significantly react to the ECB monetary shock. We explain the lack of spillovers, from the ECB, toward the CEECs monetary rates, by the introduction of the real effective exchange rate which absorbs most of the shock. We control the good specification of our model, looking at the IPI response after a shock on the domestic interest rate. As expected, we find (after one lag, as the domestic rate appears lower in the Cholesky ordering), a small but significant negative impact, which disappears after one year. The negative outcome on IPI is coherent, with what has been expected.

To understand the extent to which, the exchange rate regime may play a role, on the importance of international monetary spillovers, we compare the previous results with countries under a pegged regime. Following this strategy and according to the specific design of the EA accession, we will focus on Baltic states (Estonia, Latvia and Lithuania) plus Bulgaria. Bulgaria entered, during the nineties, a currency board arrangement. Baltic states also pegged their currency (currency board or pegged regime) and quickly entered the ERM-II. We look also

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[9]Instead of using the implicit GDP deflator as commonly used, it is possible to introduce the HICP; year-on-year core-inflation is introduced instead. The response function presents the same output, with a not significant short run puzzle. The results remain unchanged to a different lag order.

for Slovenia and Slovakia. However, these two countries adopted a flexible regime before the ERM-II entry and remain not enough time in the ERM-II, to significantly enter our group. Due to data availability, Malta and Cyprus were dropped out.

In this specification, according to the pegged status, we do not introduce the exchange rate, in the VAR specification. As the domestic monetary policy, directly, import the ECB policy, even more in case of a currency board, we modify our Cholesky ordering, introducing the domestic rate in the second position, before the GDP and prices measure. Due to the constraint of balanced panel requirement, the period ends in 2011. We could have increased the time span further, but we would have lost countries that entered the EA sooner (such as Estonia or Latvia). We preferred to reduce the time span, instead of preventing us, from a sufficient cross-section dimension.

The results, presenting the pegged regimes, after a positive shock imposed on the ECB monetary policy rate, are available on appendix (2.C) figure (2.8). We observe a positive reaction of the domestic rate, after three periods, coherent with the "import" of the ECB monetary policy. The monetary contraction leads to a significant decrease, in the IPI growth rate, by the same time of the domestic rate increase. The price index highlights a similar behaviour with some delay. Results are not strongly significant, due to the relatively small number of observations.

2.6.2   The variance decomposition

As IRFs provide information about the amplitude, but not about the importance of the changes, we consider the forecast error variance decomposition (FEVD). It allows to identify how strongly a variable plays a role in the volatility of another one. In the case of monetary spillovers, understanding the extent to which a variable behaviour is impacted, represents some interesting insight and allow to draw comparison over different groups of countries and/or periods.

As we previously mentioned, the contemporaneous period observes the ZLB monetary strategy of the ECB. To implement a focus on this period, we drive our model over the 2010-2018 time span (results of the IRFs are presented in the appendix, figure 2.9 page 79). The graphs 2.3, 2.4 and 2.5 present respectively the FEVD of the IPI, the domestic rate and the price index. Each graph deals for flexible countries and refers to the main specification, then we disentangle any change over the last decade, last we compare with pegged regime.

 Looking at the IPI variance, on graph 2.3, we observe two noticeable results. Over the entire period, in flexible countries (graph 2.3a), the shadow rate seems to have played a significant role, in the middle-long-term variance, as it represents more than 20% of the explained vari-

(a) Flexible countries   (b) After 2010   (c) Pegged countries

Figure 2.3 – FEVD: a closer look at the IPI variance

Note: The Forecasted Error Variance decomposition is presented up to a fifteen-period projection (vertical bars). Each colour represents the share, among total variance, played by its respective variable, to explain the variance. Here we present the variance analysis of the IPI, explained by the IPI index itself, the shadow rate, the exchange rate, price index and the domestic money-market rate. We provide a distinction for flexible countries, a focus after the 2008 turmoil and a comparison with pegged countries (where the exchange rate is dropped from the simulation.

ance, three years after the simulated shock. However, at the end of the period (graph 2.3b), the impact of the shadow rate almost disappeared (which corroborates the lack of significant impact, from the shadow rate, over the IPI, on IRF 2.9c, on appendix).[10] Instead, the impact of the real effective exchange rate, found to be marginal, on the overall period, slightly increases after 2010.[11] The decrease in the role of the shadow rate, to the benefit of the exchange rate (to some small extent), may be interpreted, as an increasing efficiency of domestic monetary policy and trustful monetary institution. Unconventional monetary measures, from the ECB, seems to lead to weakened monetary spillovers, toward the CEECs. To confirm the exchange rate channel, when we consider the FEVD of the REER, the relative importance of the domestic variables (IPI, prices and 3-months money market rate) increases, in the period after the 2008 crisis, compared to the overall period.

Before going further, we have a look at the behaviours among pegged economies (graph 2.3c). Unsurprisingly, the role played by the shadow rate in the IPI variance is relatively more important, as pegged economies directly import the ECB monetary policy. Compared to floating economies, the IPI is found to be more aware of monetary policies instrument (more than 40% against 30% in floating economies).

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[10]We draw the estimation of the model before 2008 and find results in line with the entire period found on FEVD 2.3a.

[11]After 2010, as a robustness, we replace the REER-19 EA partners by the REER-37 partners, i.e., the real effective exchange rate, with the 37 biggest international partners. Unsurprisingly, the role played by the shadow rate increase a little as we introduce extra-EU dimension in the exchange rate. However, the share of the variance, the shadow rate explains, remains far beyond what has been found on FEVD 2.3a

The relatively high ECB monetary spillovers, toward the domestic GDP, on the overall period, can be explained through two channels. The first one is the well-known euroization phenomenon. A higher level of euroization hamper the domestic monetary policy, as real variables, such as GDP and investment are directly impacted by the ECB policy, through the relative price of capital. Indeed, in case of an increase of the ECB monetary rates, households tend to increase their savings denominated in Euro which is counterproductive. At the domestic level, firms, in the same situation, tend to increase their investment, in domestic currency, as it become relatively more profitable to do so. The decrease of the euroization over the last years comes close to the lower monetary spillovers, observed after 2010.

The second channel is explained, by the reaction of the EMU output. The ECB contraction implies changes in the EMU GDP; Given the common market framework, it induces changes in the trade balance for the CEECs. To better understand this phenomenon, one may have a look at the share of CEECs exports, devoted to Euro area member states. Data, available on Eurostat, reveal that in 2015, exports from Hungary Poland and Romania to the EMU represent respectively 55 percent, 45 percent and 55 percent of their total exports.[12] At the same time, Czech Republic is strongly integrated in the German supply chain.

From the domestic rate point of view (figure 2.4), the price index is an important driver of

(a) Flexible countries	(b) After 2010	(c) Pegged countries

Shadow rate   REER   IPI index   Price index   Domestic rate
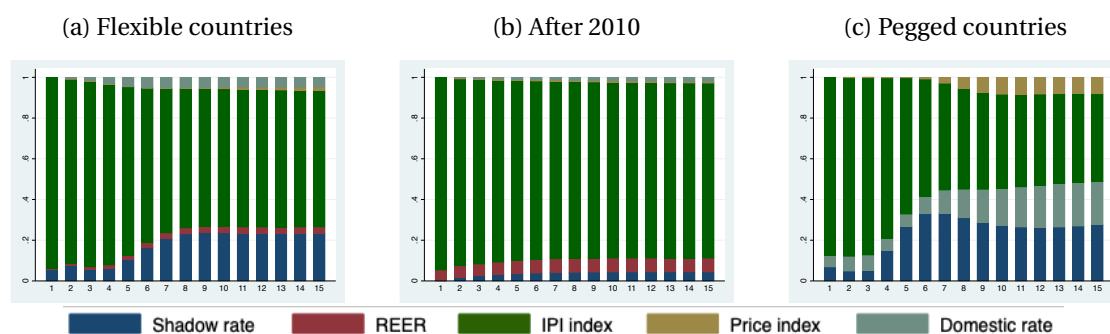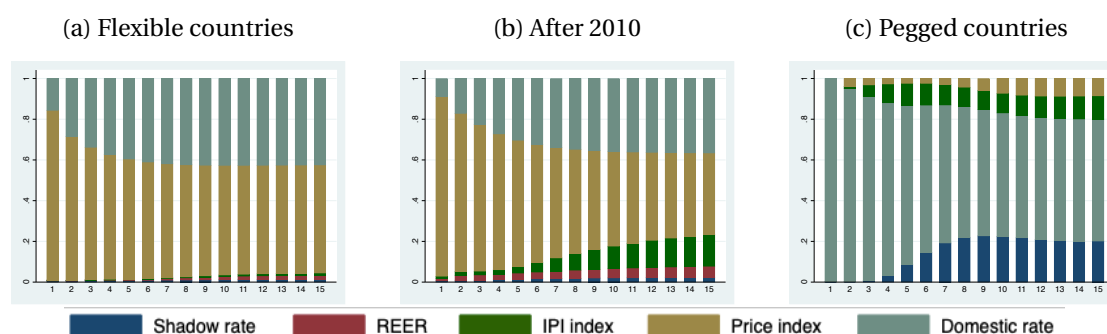
Figure 2.4 – FEVD: a closer look at the domestic rate variance

Note: The Forecasted Error Variance decomposition is presented up to a fifteen-period projection (vertical bars). Each colour represents the share, among total variance, played by its respective variable, to explain the variance. Here we present the variance analysis of the domestic 3-month money market rate, explained by the GDP index, the shadow rate, the exchange rate, price index and the domestic rate itself. We provide a distinction for flexible countries, a focus after the 2008 turmoil and a comparison with pegged countries (where the exchange rate is dropped from the simulation.

the monetary policy on the overall period and robust to the focus on the more recent years (graphs 2.4a & 2.4b). This result, as expected, confirms the relative high weight, given to prices,

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[12]ratio of: $\frac{exports\ devoted\ to\ euro\ zone}{total\ exports}$; available on Eurostat (2016).

in inflation targeting strategies. The GDP significantly influence the domestic monetary policy only over the last decade, while external factors remain of low intensity (no impact from the shadow rate). Once again, not surprisingly, in pegged countries, the domestic rate responds to the ECB monetary policy.

Last, we provide, some elements over the CPI variance. Last, we provide some elements

(a) Flexible countries   (b) After 2010   (c) Pegged countries
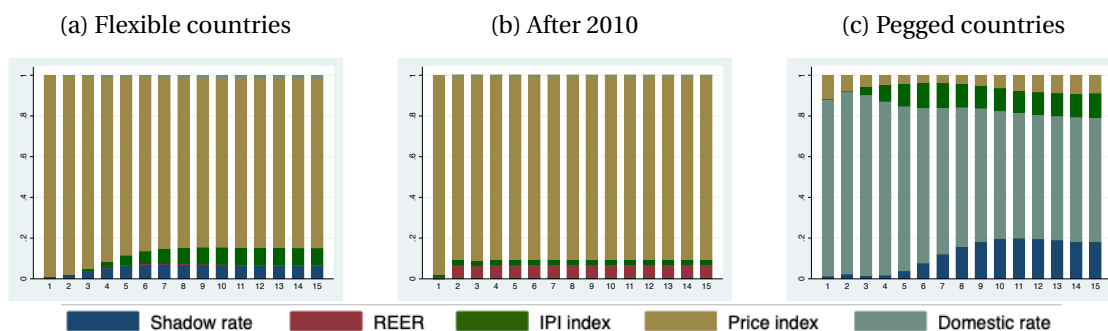
Figure 2.5 – FEVD: a closer look at the CPI index variance

Note: The Forecasted Error Variance decomposition is presented up to a fifteen-period projection (vertical bars). Each colour represents the share, among total variance, played by its respective variable, to explain the variance. Here we present the variance analysis of the Price index, explained by the GDP index, the shadow rate, the exchange rate, price index itself and the domestic money-market rate. We provide a distinction for flexible countries, a focus after the 2008 turmoil and a comparison with pegged countries (where the exchange rate is dropped from the simulation).

concerning the price index (figure 2.5). We note the relatively high persistence of the variable itself in its variance. Note that, the inflation targeting strategy may explain this behaviour, while in pegged economies, the monetary policy (domestic and foreign) seems to drive, most of the inflation volatility.

2.7   Conclusion

This paper aims at highlighting the importance for open economies in Central and Eastern Europe, to integrate in their macroeconomic policies, the ECB monetary decisions. In the case of the single ECB monetary policy, a panel estimation with a VAR specification, gives rather better results. Moreover, panel estimation is an efficient way to deal with short time span and allows to understand the average spillovers over EU non-Euro countries.

We implemented different countries approaches, according to their exchange rate regime. The underling goal was to disentangle, to what extent, the countries, still on the verge of the

EMU, depends on the EA monetary shocks. Our sub-panel of flexible economies considers Czech Republic, Hungary, Poland and Romania. As expected, we found monetary adjustments, through the reel effective exchange rate, to absorb part of the monetary shocks. A direct impact on the GDP growth rate confirms the monetary spillovers, toward real economy. The almost lack of significant impact on prices is not fully surprising as all the economies, included in the panel, hardly fought inflation over the period. Moreover, the 'floating' economies entered an inflation targeting strategy which reinforce the absence of response of the inflation rate to ECB monetary shocks.

A deeper look, at the variance decomposition, allows us to think about the extent to which, the ECB monetary rate influences our variables in the middle term. Unsurprisingly, in flexible exchange rate countries, prices volatility is relatively more important to draw the domestic monetary policy. Regarding the GDP variance decomposition, we observe a significant role of the ECB shocks. However, this role, relatively higher in pegged economies, seems to have decreased over the last decade, increasing the role of the exchange rate to absorb the shocks. As expected, pegged economies consider the shadow rate, to design the domestic monetary policy. We find no trace of such relationship, in our panel of floating economies.

This point leads us to conclude that the CEECs developed credible monetary institutions, strong enough to drive the domestic monetary policy, even in the EU context, with a still present euroization. A relevant extension will focus on the heterogeneity of the financial and banking sectors developments in the CEECs and the underlying role of the cross-border lending channel. Furthermore, a deeper analysis of the banking integration will introduce the role of macroprudential tools, implemented by the policymakers to smooth shocks toward the real economy.

The CEECs strongly focused on their inflation rate over the last twenty-five years. Now that inflation is more or less under control, it is time for these countries to switch through real objectives. As mentioned during this paper, those results are converging to the idea that countries tend to homogenize their monetary policy. This strengthens their economies and stimulates a better further integration to the monetary union. Nevertheless, EMU accession should not be a leitmotiv and the focus on the country development remains the primary goal of monetary institutions. Some recent insights, on the inflation development in Bulgaria, Croatia and Romania, let the nominal and real convergence challenge, a highly topical issue.

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Appendices for chapter 2

2.A   Some other statistics

(a) Czech Republic

(b) Hungary

(c) Poland

(d) Romania
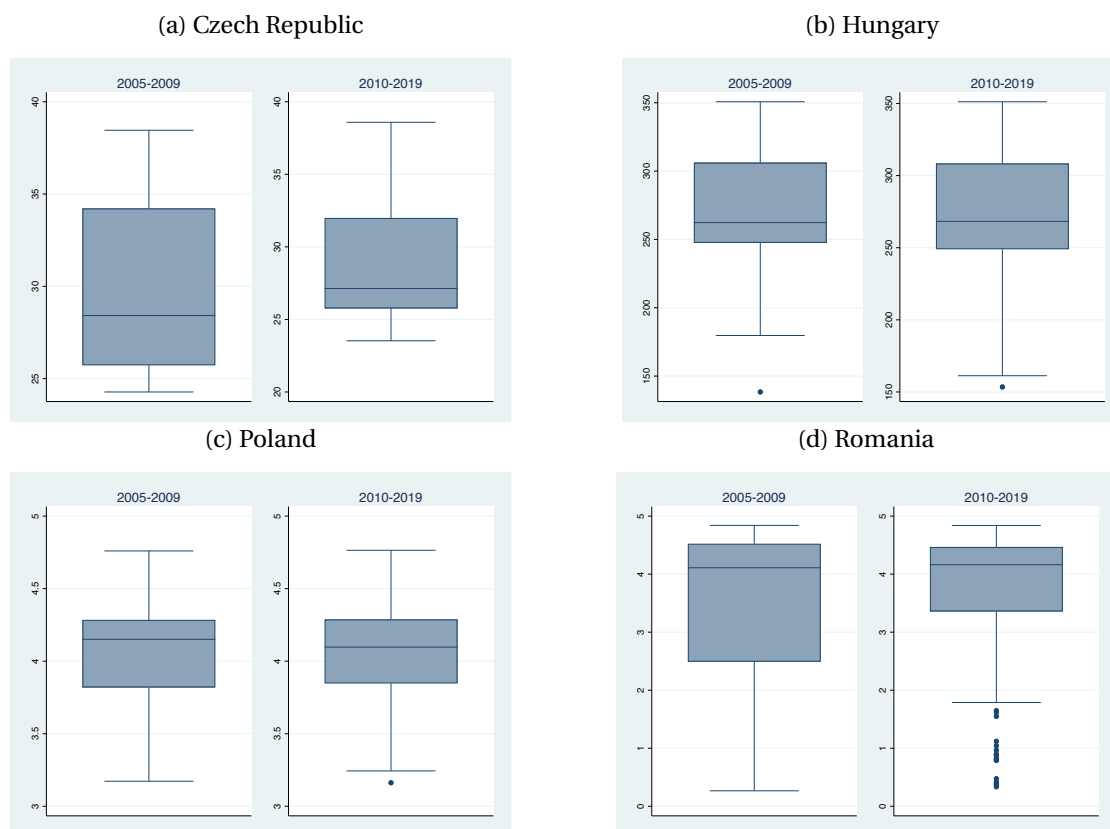
Figure 2.6 – Exchange rates

Note: The graph present the boxplot of the exchange rate with the Euro, by country, over two subperiods i.e. from 2005 to 2010 (left box) and from 2010 to last data available (right box), at a monthly frequency (source: Eurostat [ert_bil_eur_m]. The identifier refers to domestic currency, namely CZK for Czech koruna, HUF for Hungarian forint, PLN for Polish zloty and RON for Romanian leu.

Table 2.2 – Countries characteristics

Country name	Data availability	EA member	Exchange rate regime
Slovenia	1998q2 - 2006q4	2007	Pegged*
Cyprus	1999q1 - 2007q4	2008	Pegged*
Malta	2000q2 - 2008q1	2008	Pegged*
Estonia	1996q1 - 2010q4	2011	Pegged*
Latvia	1997q3 - 2013q4	2014	Pegged*
Lithuania	1999q1 - 2014q4	2015	Pegged*
Bulgaria	2000q1 - 2019q4	No	Pegged
Croatia	2000q2 - 2019q4	No	Soft peg
Czech Republic	1996q2 - 2019q4	No	Managed - IT**
Hungary	1995q2 - 2019q4	No	Floating - IT
Poland	2002q2 - 2019q4	No	Free floating - IT
Romania	1995q3 - 2019q4	No	Floating - IT

Notes: * Corresponds to the exchange rate regime before the EMU accession. ** IT refers to the Inflation Targeting strategy.

Table 2.3 – Variables Summary

Variable	Description	Level of integration
Output	Industrial Production Index (SCA)	I(1)
Prices	Implicit price (GDP deflator)	I(1)
ECB rate	Shadow rate from Wu and Xia (2016)	I(0)
Domestic rate	3-month money market interest rate	I(0)
Exchange rate	REER EA-19 deflated	I(0)

Figure 2.7 – Euribor versus Shadow rate
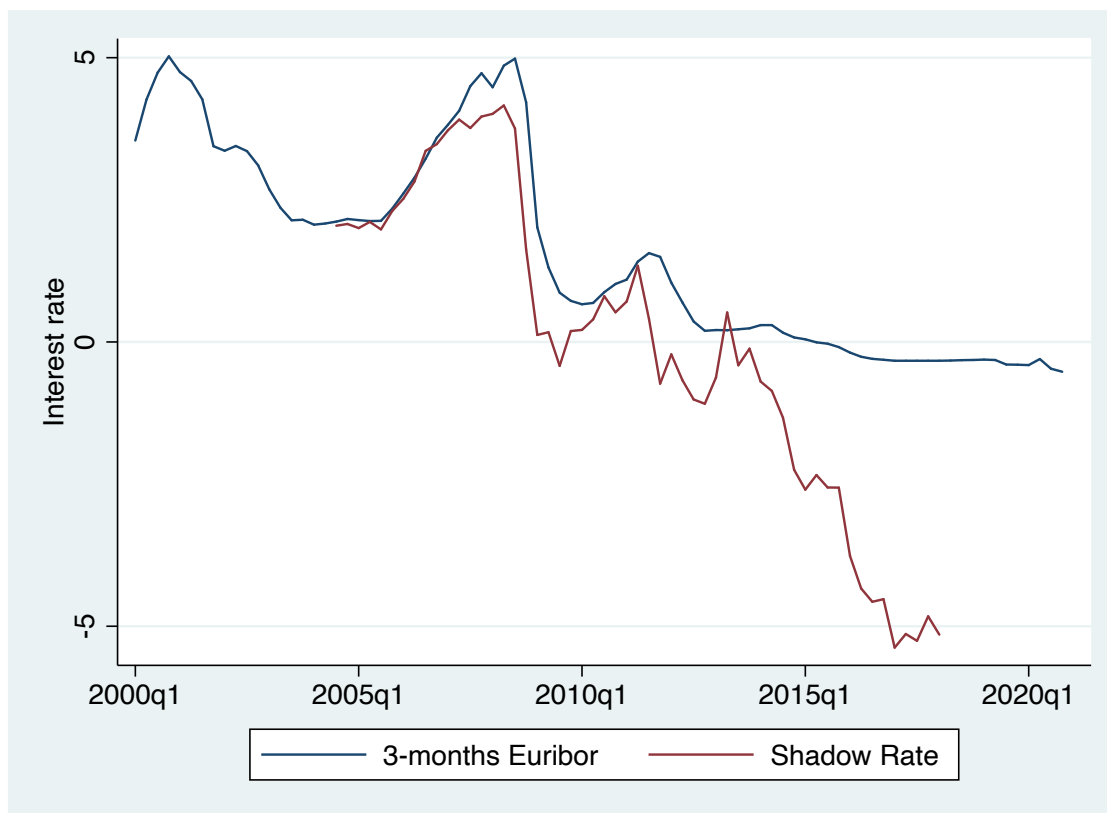
Note: The 3-months Euribor is extracted from Eurostat [irt_st_m] and the shadow rate refers to previous work from Wu and Xia (2016); the shadow rate for the European Central bank is available on Qandl website. The disconnection appears to be clear in the aftermath of the 2008 economic crisis and even more since the sovereign debt turmoil in the EA.

2.B Unit-root test results

Table 2.4 – Unit root test results

Variable	Nb. periods (Avg.)	Nb. groups	Test stat. $\bar{W}_t$	P-val. for $\bar{W}_t$
Domestic rate	54	28	-5.45	0.00
REER	97	28	-5.14	0.00
Shadow rate	55	28	10.21	1.00
Shadow rate (detrended)	55	28	-8.97	0.00
IPI	77	28	-0.43	0.33
IPI (growth rate)	73.14	28	-13.96	0.00
Price deflator	95	27	-11.10	0.00

Panel unit-root tests have been performed using the Im-Pesaran-Shin test (IPS) (2003), under the null that all panels have a unit root. According to the debate upon panel unit-root tests, other statistical analysis have been implemented. Whatever the implemented test, we systematically obtain the same conclusions. The industrial production index presents mixed results once detrended. Therefore, we opt for the use of the IPI growth rate, as tests results are unanimous to reject the null hypothesis.

2.C IRFs

(a) Shadow rate   (b) Domestic rate   (c) IPI growth rate

(d) Price index

Figure 2.8 – IRFs in "pegged" countries

Note: The solid lines are the impulse response functions whereas, the dashed one represent the 95 percent confidence interval; Errors are generated with 500 repetitions of Monte Carlo simulation. We impose a one standard deviation shock on the shadow rate and observe the response, over thirty periods, of the different variables among pegged economies.

(a) Shadow rate   (b) REER   (c) IPI growth rate

(d) Price index   (e) Domestic interest rate
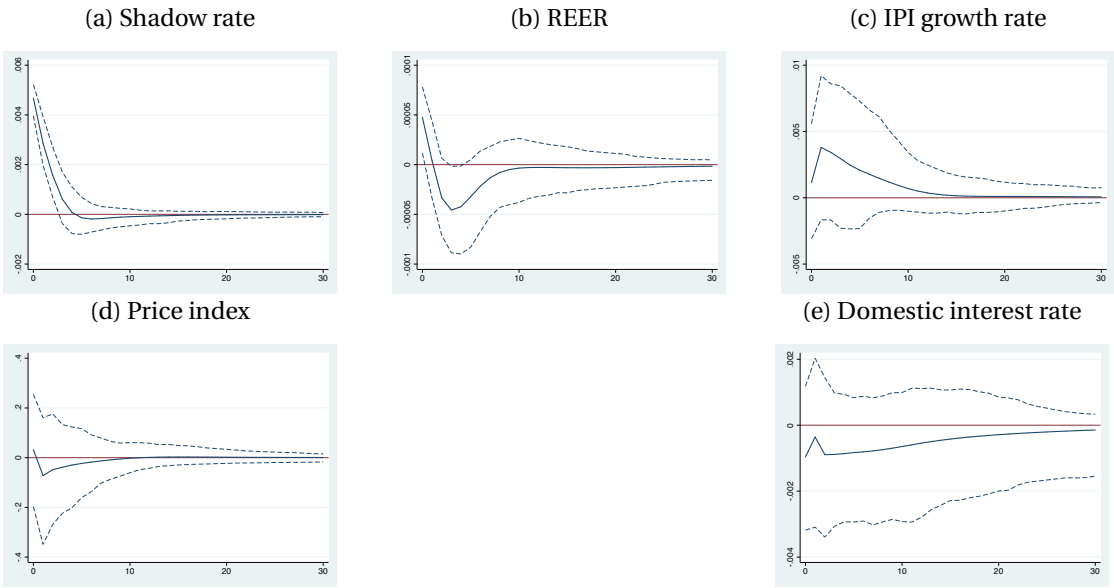
Figure 2.9 – IRFs after the 2008 crisis

Note: The solid lines are the impulse response functions whereas, the dashed one represent the 95 percent confidence interval; Errors are generated with 500 repetitions of Monte Carlo simulation. We impose a one standard deviation shock on the shadow rate and observe the response, over thirty periods, of the different variables among flexible exchange rate countries.

(a) REER (b) IPI growth rate (c) Domestic interest rate

(d) REER FEVD (e) IPI FEVD (f) Price index

| Shadow rate | REER | IPI index | Price index | Domestic rate |
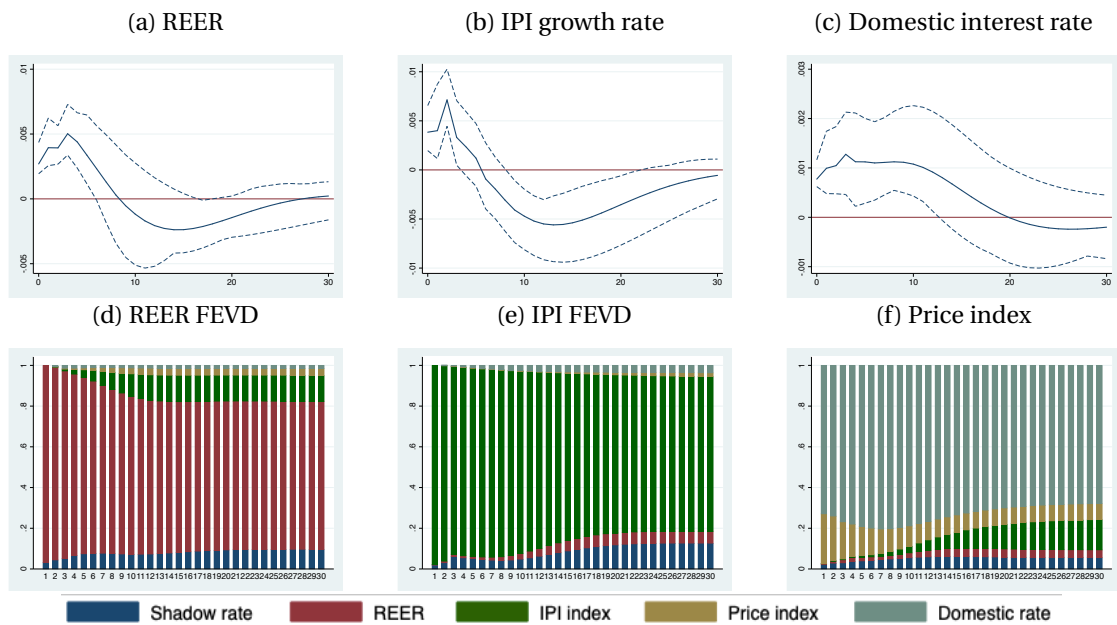
Figure 2.10 – Main IRFs & FEVD: monthly frequency

Note: The solid lines are the impulse response functions whereas, the dashed one represent the 95 percent confidence interval; Errors are generated with 500 repetitions of Monte Carlo simulation. We impose a one standard deviation shock on the shadow rate and observe the response, over thirty periods, of the different variables among flexible exchange rate countries.

The FEVD is presented up to a thirty periods projection (vertical bars). Each color represents the share, among total variance, played by its respective variable, to explain the variance.

For the monthly frequency, we use the year-on-year change in both Industrial Production Index and the core HICP, to consider respectively output and prices. Core inflation corresponds to the harmonized index of consumer price, excluding food and energy item.

2.D Variables definition

European Central Bank Shadow Rate: The shadow rate is computed using the method of Wu and Xia (2016). Extracted from Quandl databases, we focus on the ECB indicator, available on the following permanent link: https://www.quandl.com/data/SHADOWS/EUROPE.

Domestic rate: We use the 3-month money market interest rate, from Eurostat database [irt_st_m] available for EU countries outside of euro area. Punctually, to consier countries, member of the monetary union, we refer to the same serie extracted in historical database [irt_h_mr3].

Real Effective Exchange Rate: The REER, used for flexible exchange rate regime measures change in competitiveness of a country. The series consider the change in prices or costs relative to its principal competitors, in international markets. To get this "relative price and cost indicator", the nominal effective exchange rate is deflated by either the nominal unit labour costs or the consumer prices index; Eurostat data [ert_eff_ic_q];

Output: The industrial production index, from Eurostat [sts_inpr_q], at a quarterly frequency, is compiled by Eurostat, seasonally and calendar adjusted and integrate a list of indicators, the PEEIs (Principal European Economic Indicators). Referring to the literature and to data availibility, we prefer the index covering the NACE Rev.2 from B to D, i.e., Mining and quarrying; manufacturing; electricity, gas, steam and air conditioning supply. NACE classification refers to statistical classification of economic activities in the European Community. More details upon the short-term business statistics and index construction are available online.

Domestic prices: The implicit deflator series, according to Eurostat [namq_10_gdp] is the price index derived as a ratio of current price to chain-linked volumes and give indication of underlying price changes. We use the percentage change compared to same period in previous year.

2.E   Results from panel-VAR estimation

Table 2.5 – Gross Results from panel-VAR estimation

	Main results	Cholesky order	Sub-period	Pegged countries
Eq.1: Shadow-rate				
L1.Shadow-rate	0.751***	0.751***	0.517***	0.631***
	(0.080)	(0.080)	(0.099)	(0.106)
L1.REER	0.395	0.395	4.759*	
	(1.297)	(1.297)	(2.641)	
L1.IPI	0.059***	0.059***	0.072***	2.561**
	(0.011)	(0.011)	(0.019)	(1.036)
L1.Inflation	-0.000	-0.000	-0.001	-0.001
	(0.000)	(0.000)	(0.001)	(0.042)
L1.Domestic-rate	-0.046	-0.046	-0.181	-3.637
	(0.047)	(0.047)	(0.115)	(3.734)
L2.Shadow-rate	-0.079	-0.079	-0.015	-0.170
	(0.078)	(0.078)	(0.095)	(0.113)
L2.REER	-0.142	-0.142	-2.116	
	(1.219)	(1.219)	(2.474)	
L2.IPI	-0.029**	-0.029**	-0.072***	-1.031
	(0.012)	(0.012)	(0.020)	(1.062)
L2.Inflation	0.000	0.000	0.002	0.166***
	(0.000)	(0.000)	(0.001)	(0.044)
L2.Domestic-rate	0.034	0.034	0.175	14.602***
	(0.044)	(0.044)	(0.116)	(3.854)
Eq.2: REER				
L1.Shadow-rate	0.009**	0.009**	-0.007*	
	(0.005)	(0.005)	(0.004)	
L1.REER	0.910***	0.910***	0.804***	
	(0.073)	(0.073)	(0.101)	
L1.IPI	0.002**	0.002**	0.002**	
	(0.001)	(0.001)	(0.001)	
L1.Inflation	0.000	0.000	0.000	
	(0.000)	(0.000)	(0.000)	

Continued on next page

Table 2.5 – continued from previous page

	Main results	Cholesky order	Sub-period	Pegged countries
L1.Domestic-rate	0.004	0.004	0.003	
	(0.003)	(0.003)	(0.004)	
L2.Shadow-rate	-0.011**	-0.011**	-0.003	
	(0.004)	(0.004)	(0.004)	
L2.REER	-0.152**	-0.152**	-0.098	
	(0.069)	(0.069)	(0.094)	
L2.IPI	-0.002**	-0.002**	-0.000	
	(0.001)	(0.001)	(0.001)	
L2.Inflation	-0.000	-0.000	-0.000	
	(0.000)	(0.000)	(0.000)	
L2.Domestic-rate	-0.002	-0.002	0.001	
	(0.002)	(0.002)	(0.004)	
Eq.3: IPI				
L1.Shadow-rate	0.610	0.610	0.617	-0.008
	(0.453)	(0.453)	(0.489)	(0.010)
L1.REER	-2.630	-2.630	-4.097	
	(7.326)	(7.326)	(13.104)	
L1.IPI	1.130***	1.130***	0.775***	1.184***
	(0.064)	(0.064)	(0.095)	(0.100)
L1.Inflation	-0.006**	-0.006**	-0.006	-0.002
	(0.003)	(0.003)	(0.006)	(0.004)
L1.Domestic-rate	-0.438	-0.438	-0.433	-0.270
	(0.265)	(0.265)	(0.572)	(0.361)
L2.Shadow-rate	-1.592***	-1.592***	-0.280	-0.037***
	(0.441)	(0.441)	(0.474)	(0.011)
L2.REER	-1.561	-1.561	-5.282	
	(6.882)	(6.882)	(12.274)	
L2.IPI	-0.332***	-0.332***	-0.055	-0.362***
	(0.066)	(0.066)	(0.099)	(0.103)
L2.Inflation	0.004	0.004	0.004	0.006
	(0.003)	(0.003)	(0.006)	(0.004)
L2.Domestic-rate	0.192	0.192	0.381	0.530

Table 2.5 – continued from previous page

	Main results	Cholesky order	Sub-period	Pegged countries
	(0.251)	(0.251)	(0.576)	(0.373)
Eq.4: Inflation				
L1.Shadow-rate	16.333	16.333	-2.840	0.812
	(27.843)	(27.843)	(25.502)	(0.721)
L1.REER	-85.758	-85.758	-1509.011**	
	(450.263)	(450.263)	(683.198)	
L1.IPI	5.544	5.544	5.518	5.270
	(3.951)	(3.951)	(4.955)	(7.047)
L1.Inflation	0.379**	0.379**	0.150	-0.200
	(0.169)	(0.169)	(0.296)	(0.289)
L1.Domestic-rate	-15.040	-15.040	-1.843	-77.896***
	(16.290)	(16.290)	(29.836)	(25.389)
L2.Shadow-rate	10.558	10.558	-23.915	-1.318*
	(27.104)	(27.104)	(24.699)	(0.770)
L2.REER	361.001	361.001	1309.394**	
	(422.996)	(422.996)	(639.934)	
L2.IPI	-1.129	-1.129	-2.367	4.884
	(4.052)	(4.052)	(5.177)	(7.223)
L2.Inflation	0.443***	0.443***	0.330	0.810***
	(0.166)	(0.166)	(0.308)	(0.296)
L2.Domestic-rate	15.231	15.231	3.940	55.187**
	(15.411)	(15.411)	(30.028)	(26.203)
Eq.5: Domestic rate				
L1.Shadow-rate	0.047	0.047	0.041	-0.003
	(0.291)	(0.291)	(0.256)	(0.008)
L1.REER	-1.068	-1.068	5.765	
	(4.703)	(4.703)	(6.851)	
L1.IPI	-0.043	-0.043	-0.054	-0.128
	(0.041)	(0.041)	(0.050)	(0.081)
L1.Inflation	0.008***	0.008***	0.010***	0.009***
	(0.002)	(0.002)	(0.003)	(0.003)
L1.Domestic-rate	1.282***	1.282***	1.113***	1.493***

Table 2.5 – continued from previous page

	Main results	Cholesky order	Sub-period	Pegged countries
	(0.170)	(0.170)	(0.299)	(0.293)
L2.Shadow-rate	-0.247	-0.247	0.088	0.016*
	(0.283)	(0.283)	(0.248)	(0.009)
L2.REER	0.989	0.989	-4.646	
	(4.419)	(4.419)	(6.417)	
L2.IPI	0.018	0.018	0.068	-0.001
	(0.042)	(0.042)	(0.052)	(0.083)
L2.Inflation	-0.006***	-0.006***	-0.005	-0.009**
	(0.002)	(0.002)	(0.003)	(0.003)
L2.Domestic-rate	-0.405**	-0.405**	-0.156	-0.675**
	(0.161)	(0.161)	(0.301)	(0.302)
Nb observations	208.00	208.00	120.00	96.00
Nb. periods	52.00	52.00	30.00	24.00
Nb groups	4.00	4.00	4.00	4.00
R^2 Eq.1: Shadow-rate	0.70	0.70	0.44	0.74
R^2 Eq.2: REER	0.77	0.77	0.81	.
R^2 Eq.3: IPI	0.83	0.68	0.60	0.89
R^2 Eq.4: Inflation	0.79	0.83	0.49	0.81
R^2 Eq.5: Domestic rate	0.68	0.79	0.75	0.81

Standard errors in parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Notes: This table presents results from panel system-VAR estimation over the different sub-estimation presented in chapter 2; columns (1) refers to the main estimation;

column(2) reorders the variables; column (3) focus on the end of the period; column (4) provides a comparison with pegged economies (no REER coefficient and Eq. 2 does not exist) ;

3 Inflation and unemployment, new insights during the EMU accession

This chapter is joint work with Jean-Louis Combes (CERDI, Université Clermont Auvergne, France)

3.1 Introduction

During Summer 2020, Bulgaria and Croatia engaged in the ERM-II as the *last step* before entering the Euro area (EA). For at least two years, these two countries are engaged in a convergence process; they have to maintain the exchange rate closed to the pivot, defined by the time of their ERM-II entry.[1] Entering the EA is followed by the loss of the monetary policy autonomy. According to Jorda et al. (2018), the Phillips curve is an interesting empirical way to assess the monetary policy efficiency. In light of the Phillips curve, we expect such a shock to provoke changes in the existing link between the nominal and the real economy.

For a decade, unemployment and inflation rates, in the CEECs, tend to converge to low level.[2] The transition of the CEECs, toward market economies, were initially hit by huge pressure on both inflation and unemployment. A quarter of century later, inflation rates seem to be under control. However, the relatively high economic recovery, observed in the CEECs, in the most recent years, after the economic and sovereign debt crisis, is expected to lead to inflationary pressure.

At the same time, some of the CEECs, namely Baltic states, Slovenia and Slovakia entered

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[1]According to the July 10th, 2020 Press release, the central rate of the Bulgarian Lev is set at 1 Euro = 1.95583 Leva and the central rate of the Croatian Kuna is set at 1 Euro = 7.53450 Kuna. A standard fluctuation band is set at plus or minus 15 percent around the central rate. Bulgaria unilaterally decided to maintain during the overall ERM-II period a currency board regime.

[2]This is specifically the case in Czech Republic, Hungary and Poland; to a lesser extent in Bulgaria, Croatia and Romania where the HICP index in the last years is on a higher trend.

the EA. They switch from different exchange rate regimes, toward the loss of their monetary autonomy. In the context of the EU, where the EA, as a monetary union, is characterized, by a single monetary policy, we question whether we observe a significant Phillips curve, in peripheral countries. As the EA monetary policy reacts to the global EA labour market, does the EA accession represent a shock to explain potential change, in the inflation/unemployment behaviours?

To answer this question, we refer to recent work, on the Phillips curve, from McLeay and Tenreyro (2020) and Jorda et al. (2018), using a panel approach to tackle the identification strategy issues. According to McLeay and Tenreyro (2020), to justify the panel dimension, the central bank, from a monetary union, uses weighted average of the different "regions". Following Jorda et al. (2018), small open economies with fixed exchange rate regime import the monetary policy. Based on this identification strategy, we are able to consider the CEECs, in the ERM-II and in the EA, within a panel dimension.

To our knowledge, there is a scarce literature, on the impact of the EA accession process, regarding the monetary policy transmission toward the real economy. Even if the Phillips curve, in itself, represents more a result of monetary efficiency than a monetary tool, the evaluation of the inflation/unemployment relationship may help policymakers, in small open economies, to apprehend how monetary institution may influence their own decision. Under the usual New Keynesian Phillips Curve (NKPC) à la Coibion and Gorodnickenko (2015) and McLeay and Tenreyro (2020), we use quarterly data on inflation and unemployment, to detail the Phillips curve, in different group of countries from inside the EU-28. Drawing a comparison between sub-periods and sub-groups, we found a significant Phillips curve coefficient in the EA; even in the CEECs, while they belong to the ERM-II. However, their EA accession seems to be accompanied by the loss, of both monetary autonomy and the significant Phillips curve. This result is robust to change in variables definition and is not influenced by the contemporaneous economic and sovereign debt crisis. To corroborate our result, we highlight that the "leader" economies, of the EA, still have a significant inflation/unemployment relationship. This comes closed to the idea, that entering a monetary union may have heterogeneous effects, given the size of such economy. The paper is organized as follows: section 3.2 presents the literature concerning the recent Phillips curve development and some empirical issues to be tackled. Section 3.3 & 3.4 describe the model and the way we empirically implement it. Data are analysed in section 3.5 while section 3.6 detail our results and their implication in terms of monetary & budgetary policy. Last, section 3.7 concludes our paper.

3.2 Literature review

In the debate, around the inflation behaviours, in the aftermath of the 2008 crisis, the literature highlights the lack of a Phillips curve, as inflation changes were weak compared to what has been actually expected (Blanchard et al., 2015; Blanchard, 2016; Ciccarelli and Osbat, 2017). Among the multiple solution proposed to deal with this phenomenon, Barnichon and Mesters (2020b) conclude that the anchoring of inflation expectations is an important driver to explain the new relationship that exist between inflation and unemployment.

The role of rational inflation expectation provides evidence in the NKPC (Ball and Mazumder, 2011, 2019).[3] This is, to some extent, thanks to particularly anchored inflation expectation, that unconventional monetary measures, from the ECB's, in the European context, allow to tackle risks around price stability (Ciccarelli and Osbat, 2017). According to Ball and Mazumder (2019), expected inflation, measured by surveys of forecasters, explains fluctuations in core inflation. However, no significant effect, of ECB's unconventional announcements, has been found by Enders et al. (2019), using firms' surveys, upon their inflation expectations. The issue arises from the expectation measure. Coibion and Gorodnickenko (2015) suggest that the role of firms' expectation, if anchored to households, justify the missing disinflation between 2009-2011, while oil prices increased at the same time, increasing households expectations. Coibion et al. (2018), using a model of expectation formation, conclude of the importance of detailed survey data to address such an issue.

Besides the expectation measure problem, the labour market institutions (like wage coordination or trade union density) are also found to play a role in explaining the relationship that exists between unemployment and inflation (D'Adamo and Rovelli, 2015). According to Bell and Blanchflower (2018), the recent smoother slope may be attributed to an increase in underemployment, lowering the pressure on wages. Underemployment decreases the unemployment weight on inflation, while a significant share of workers seeks to work more hours. Byrne and Zekaite (2020) points to the asymmetric wage elasticity, lower in case of high labour market slack, to explain the impact of the labour market tightness. Del Negro et al. (2020) apply a VAR and a DSGE to capture the recent disconnection between inflation and output and the subsequent role of the labour market.

In a globalized world, inflation development may be partly explained, following Forbes (2019b) and Bobeica and Jarocinski (2019), by the introduction of external factors. In the same vein, Coibion et al. (2019), in an expectations-augmented Phillips curve, highlight the importance of external inflation expectation to draw the Phillips curve. Jašová et al. (2020) estimate a NKPC and find a significant impact of both domestic and global output gaps. However, in emerging

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[3]Inflation expectations are not new in the Phillips curve development (Friedman, 1977).

economies, the effect of the global output gap on inflation slightly decreased, in the aftermath of the 2008 economic crisis.

Bobeica and Jarocinski (2019) use a structural VAR, to look at spillovers from US to Euro area inflation and to determine the extent to which domestic and global variables (GDP, employment, confidence, consumption and investment) are important to help the policymaker.

Looking at the CEECs, empirical works already highlight some interesting elements, like Jarociński (2010) who found a relatively steeper Phillips curve in the CEECs, compared to the rest of the EU. Country specific focus improves the understanding of inflation dynamics in transition economies. Sznajderska (2012) explains non-linearities in the Phillips curve, in Poland, thanks to asymmetric reactions after economic boom or slack. Fidrmuc and Daniskova (2011) and Milučká (2014) disentangle the Czech Republic Phillips curve and highlight the important role of import price (i.e., external factors), in inflation evolution. Lyziak (2016) and Nagy and Tengely (2018) confirm such arguments respectively in Poland and Hungary. Looking at the Romanian economy, Saman and Pauna (2013) find a relatively equivalent behaviour, from forward and backward-looking component, in the inflation dynamic.

3.3 Model

The Phillips curve literature recently highlights the identification issue and raises the question upon the inflation behaviour (Mavroeidis et al., 2014; Barnichon and Mesters, 2020a,b; McLeay and Tenreyro, 2020). In an optimal monetary policy framework, McLeay and Tenreyro (2020) describe, at the equilibrium, the seemingly exogenous inflation process (i.e., disconnected from output gap). The model considers two equations, the usual Phillips curve and the optimal monetary policy design. The basic reduced form of the NKPC is defined as:

$$\pi_t = \beta E_t \pi_{t+1} + \kappa x_t + u_t \qquad (3.3.1)$$

In Eq. 3.3.1, π_t refers to how far inflation is from its target; x_t is the difference between output and its potential level, namely the output gap and u_t, according to McLeay and Tenreyro (2020) is a cost-push shock. They assume that u_t follows an autoregressive (order 1) exogenous process, with persistence ρ, such that $u_t = \rho u_{t-1} + \varepsilon_t$, where ε_t are i.i.d. and mean zero.

The coefficient κ is strictly positively defined. Any increase in the output gap leads to a same sign change in inflation. According to McLeay and Tenreyro (2020), the optimal monetary policy framework, set under discretion, blurs this relationship. The policymaker minimizes a

quadratic loss-function, considering expected inflation as given:

$$\pi_t = -\frac{\lambda}{\kappa} x_t \tag{3.3.2}$$

Any cost-push shock induces a trade-off between inflation target and output stabilization. From Eq.(3.3.1) and Eq.(3.3.2), inflation path is fully determined into the model; inflation deviation appear to be proportional, to exogenous cost-push shock. Under the assumption that the monetary policy is constrained by the Phillips curve, the policymaker designs the monetary response, in line with any desired output gap. Pressures on inflation, resulting from undesirable output gap, are prevented by a successful monetary policy.

From there, the basic Phillips curve highlights the correlation between equilibrium inflation and output gap, instead of actual inflation.[4] There is no way to identify the Phillips curve, as this framework do not state any exogenous variable, that would potentially impact the monetary policy.

To get rid of this Phillips curve identification issue, disaggregated data have proven their efficiency. According to McLeay and Tenreyro (2020), the simultaneous bias is partly tackled, using regional level data. The endogenous monetary policy response, to demand shock, disappears. The aggregated Phillips curve previously defined, still holds. However, the regional dimension allows any deviation of inflation or output, at the aggregated level, to depend on the weighted average of each variable deviation, at the regional level. Moreover, every region is endowed with its own Phillips curve, as defined in Eq.(3.3.1) and suffers from idiosyncratic shocks, with possible spillovers, across regions (the error terms may be correlated across regions). Obviously, in such a framework, there is a single monetary policy response to the weighted average deviation. The Phillips curve in Eq.(3.3.1) and the IS curve (which determine the regressor and include the interest rate) are expressed in terms of regional deviation from the aggregate one:

$$\pi_t^i - \pi_t = \beta E_t(\pi_{t+1}^i - \pi_{t+1}) + \kappa(x_t^i - x_t) + \hat{u}_t^i \tag{3.3.3}$$

Even in case of optimal monetary policy response, to global deviation, the policymaker does not consider idiosyncratic regional deviation, such that, the regional Phillips curve suffers from exogenous demand shock that won't alter the aggregated one.

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[4]In McLeay and Tenreyro (2020), this corresponds to the intersection between equations 3.3.1 and 3.3.2.

3.4   Empirical strategy

We estimate the basic reduced form of the NKPC in Eq. 3.3.1, as derived in Gali and Gertler (1999), Cogley and Sbordone (2008) or more recently McLeay and Tenreyro (2020). We focus on a panel of European Union economies and derive some country heterogeneities. The European Union provides an interesting framework indeed. As a monetary union, the Euro area allows us to deal with a multi-country dimension estimation of the Phillips curve, à la McLeay and Tenreyro (2020), where each EA country is treated as a single region.

To link the regional specification, from McLeay and Tenreyro (2020), to the EA accession process, we use the specific case of Baltic states, namely Estonia, Latvia and Lithuania, plus Slovenia and Slovakia. This group of five countries present some specific peculiarities. Over the 2000-2020 period, they joined the European Union, went through the Exchange Rate Mechanism (ERM-II) and actually entered the Euro area. We expect such monetary changes to have potential impact on the empirical relationship between inflation and unemployment.

The introduction, into a common group of countries, that are not part of the EA, in the first stage, makes sense, as the ERM-II imposes a drastic monetary control. In that way, we refer to the recent work from Jorda et al. (2018) and the international finance trilemma. Under this monetary context, with free capital flows, a country almost gives up, its ability to draw the monetary policy and instead "import" the ECB interest rate shocks.[5]

The regional equation (eq. 3.3.3) derived from McLeay and Tenreyro (2020), holds some empirical limits. The first lies on the expected inflation measurement. Indeed, the authors fear a less accurate data, at the regional level. However, we circumvent this issue, using country level data and considering a multi-country approach, in the Euro area context.

The second issue states that if the cross-section deviation is similar, a clear identification of κ will be subdued. In the European context, the discretion of the budgetary policy belongs to each member states. We expect different behaviours from both policymakers and the labour market after a shock. The heterogeneous reactions, following the 2008 economic downturn, confirm that we provide a context with enough heterogeneity.[6] Moreover, any permanent cross-section deviation is captured by the introduction of individual fixed effects (μ_i). Invariant regional heterogeneities in unemployment or expected inflation illustrate those cross-section deviations that shall be captured before estimating the model.

The endogenous response of monetary policy, to aggregate cost-push shocks, remains an issue. The regional approach from McLeay and Tenreyro (2020) provides an evident solution. We

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[5]The argument from Jorda et al. (2018) states that under pegging regime, we use the absence of arbitrage and uncovered interest-rate-parity assumptions to conclude of similar returns between similar assets.

[6]To be noticed that the 2012 sovereign debt crisis confirms this argument, with increasing idiosyncratic behaviours.

first transform Eq.3.3.3 to isolate, on the left-hand side, the domestic inflation:

$$\pi_t^i = \beta E_t(\pi_{t+1}^i) + \kappa(x_t^i) + [\pi_t - \beta E_t(\pi_{t+1}) - \kappa(x_t)] + \hat{u}_t^i \qquad (3.4.1)$$

The introduction of a time fixed effect (v_t) captures monetary policy changes that are, by construction, common to every country in the monetary union.

According to Coibion and Gorodnickenko (2015), Nagy and Tengely (2018) and Bobeica and Jarocinski (2019), the global economic environment cannot be omitted in the Phillips curve estimation. The introduction of a time fixed effect deals with any worldwide shock (such as oil price deviation). The individual fixed effect, under the assumption that the state international openness remains constant, should considers the trade dependency. The following equation is estimated:

$$\pi_{it} = \delta_0 \pi_{it-1} + \delta_1 E_t \pi_{it+1} + \delta_2 x_{it} + \mu_i + v_t + \varepsilon_{it} \qquad (3.4.2)$$

where δ_0 captures the persistence of the dependant variable, under the accelerationist hypothesis; δ_1 corresponds to the weight put on expected inflation and is expected to positively impact current inflation deviation. δ_2 illustrates the slope of the Phillips curve and is our coefficient of interest. Using the unemployment gap, we expect a negative coefficient (i.e., $\delta_2 < 0$). To complete the model, we introduce a 'crisis' dummy that takes value '1' (zero otherwise), during the period 2007-2012, to deal with the specific impact of the crisis (2008 downturn and 2012 sovereign debt shock).[7]

The lagged structure imposed on the dependant variable, δ_0, induces, under a simple fixed effects model, biased estimated parameters. As our model counts for endogenous regressors, we opt for an instrumental variable (IV) estimator via generalized method of moments[8] where the unemployment gap and expected inflation are treated as endogenous.[9]

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[7]The start of the crisis dummy in 2007 comes closed to the idea that before the 2008 shock, we start observing some fluctuations in our data. Changing the exact definition of the dummy, only leads to marginal impact, upon the estimated coefficients.

[8]The main results are robust to a two stage least square approach.

[9]Expected inflation is alternatively treated as endogenous or exogenous. This won't change our results and their implications. We keep our variable endogenous, as we estimate, it better fits the intuition that expected inflation also relies on past behaviours.

3.5   Data and preliminary statistics

3.5.1   Data definition

Following the literature, like in Ball and Mazumder (2011, 2019) or Coibion et al. (2018) and McLeay and Tenreyro (2020), our dependant variable refers to *core inflation* i.e., we consider the harmonized consumer price index (HICP), excluding energy and food items. Core inflation represents the part of inflation not explained by supply shocks (Blanchard and Gali, 2007). According to Forbes (2019a), core inflation remains domestically determined, while the headline counterpart is internationally derived. The HICP index, from OECD database, is available, at a quarterly frequency (HICP index 2015 = 100). We use the year-on year-quarterly inflation rate i.e., percentage change compared to same period, previous year.[10]

The literature suggests the use of expected inflation, as a primo determinant of current inflation. Inflation expectations surveys have become a usual way, to consider the role of anchoring expectations, into the Phillips curve (Albuquerque and Baumann, 2017; Ball and Mazumder, 2019).

We use consumer surveys data, like in McLeay and Tenreyro (2020). Data, from the European Commission, cover the 1985-2020 period, at a quarterly frequency. From the consumer survey, we extract question 6 "Price trends over the next 12 months".[11] The index is defined over the [-100;100] interval and follows a seemingly normal distribution.

To measure the economic slacks, as defined in the Phillips curve developments, we use data upon the unemployment rate, extracted from OECD database, looking at the usual definition of unemployed, amongst the working age population. We use quarterly seasonally adjusted data, available from 1983 to 2019. To derive the unemployment gap, we consider a Hodrick-Prescott filter, à la Jašová et al. (2020).[12]

3.5.2   Preliminary statistics

For evident purpose of panel homogeneity and following McLeay and Tenreyro (2020) and Jorda et al. (2018), we only keep countries inside the EA, belonging to the ERM-II or having an

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[10]As inflation data are not seasonally adjusted, the use of quarter-to-quarter inflation rate introduce seasonality into the data.

[11]The exact question asked is "By comparison with the past 12 months, how do you expect that consumer prices will develop in the next 12 months? They will..."; to answer this question, respondent has a multiple-choice range (++ increase more rapidly; + increase at the same rate; = increase at a slower rate; − stay about the same; −− fall; N don't know. Then the responses are aggregated under the form of an index, regarding the share of each category; the higher the index, the higher the inflation is expected to increase.

[12]Our results are robust to the use of the Baxter-King filter instead.

exchange rate targeting monetary policy, before their ERM-II entry. Following this, Croatia, Czech Republic, Poland and Romania are kept aside. In 2008, Hungary entered a flexible exchange rate regime. Despite the country could have been kept in our sample, before 2008, we throw it away, as the country did not engage so far, to the ERM-II. As we previously mentioned, during the introduction, Bulgaria recently joined the ERM-II. However, as we want to design the impacts of changing exchange rate regime, Bulgaria do not add any information. The country indeed, entered a currency board arrangement, in the nineties and unilaterally decided to maintain such a regime during the ERM-II.

A clear identification of each EU non-Euro member is needed to understand, to what extent the EMU accession process plays a role. Table 3.6 gives detail about the exact date of transition from one state, to another. Slovenia and Slovakia were both under floating exchange rate regime, before their ERM-II accession respectively in 2004 and 2006 and remain in the ERM-II for 32(37) months respectively.

On another side, Baltic states were under currency board regime (expect for Latvia with a conventional fixed peg), during the initial stage. They entered the ERM-II, for a longer period of time (Estonia for 6.5 years, Latvia, 8.5 years and Lithuania 10.5 years).

Two other countries participate to the ERM-II over the period. Greece entered the EA in 2001-January and Denmark did not adopt the Euro, as a currency, yet and still is participating to the ERM-II. For evident purpose, of very small-time span, Greece is excluded from our analysis. Moreover, Denmark, on purpose, remains outside the EA (imposing very short fluctuation bands). We decided to keep the country aside.

Our panel counts 21 countries (i.e., EA members and EA candidates), over almost 20 years

Table 3.1 – Summary statistics

Variable	Observation	Mean	SD	Min	Max
Inflation rate	1319	1.76	1.51	-5.73	13.66
Unemployment rate	1319	9.08	4.55	1.86	27.83
Expected inflation	1301	22.90	17.94	-37.93	81.2

at a quarterly frequency. The table 3.1 provides the main statistics from our variables. The inflation rate ranges from -5.73 to 13.66 percent, on a year-on-year change, at a quarterly frequency. The largest values are observed in Estonia and Latvia suggesting a higher volatility in the inflation rate. Looking at unemployment data, the highest values in unemployment rate are observed in Spain, after the 2008 economic downturn. Unemployment gap are found to be relatively large in Estonia and Latvia. More precisely, the unemployment gap is strongly negative in the period 2007-2008 but highly positive after the 2008 economic downturn (2009-

2010) in those two countries. In both cases, this corresponds to opposite reactions in the inflation rate.

There is an overall negative correlation between inflation rate and the unemployment gap (-0.34) and a positive one between inflation and expected inflation. Before going further, we look at the statistical distribution of our variables; we implement a set of panel unit root tests (results available in appendix 3.A, table 3.5); our series are stationary and kept in level.

3.6 Results

All estimations in the following tables 3.2 and 3.3 consider the year-on-year quarterly core inflation rate, as a dependant variable.[13] We implement an IV estimator, with both individual and temporal fixed effects, plus a dummy, for the crisis, over the 2007-2012 period.[14] Using only internal instruments, our model don't suffer from overidentification issues.

The first column of table 3.2 consider the overall EA countries by their date of entrance. The second column, to confirm the results found on the EA, focus on the EU-15 economies, as the main drivers of the ECB monetary policy. The third estimation looks at the CEECs[15] over the global period (i.e., without ERM-II vs EA distinction). This third approach does not seem to be incorrect as the ERM-II may be associated with an exchange rate targeting strategy. Before their ERM-II accession, we only consider the Baltic states. As Slovenia and Slovakia adopted a flexible exchange rate before the ERM-II, both are dropped during this first period. In every specification, we find a significant negative Phillips curve coefficient, in line with the literature. The comparison between the CEECs and the rest of the EU does not allow us to conclude on a steeper Phillips curve in the CEECs, as found by Jarociński (2010). The coefficient of the unemployment deviation seems to be relatively stable among the different estimations. As expected, both forecasted inflation and persistence on inflation significantly impact the dependant variable, which corroborates Ball and Mazumder (2019). The dummy crisis is only significant in the CEECs.

From there, we want to disentangle whether changes, according the status inside the EU, do impact the relationship between inflation and unemployment. We postulate that we can

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[13]In line with Blanchard et al. (2015) we use headline inflation rate instead of core inflation as a robustness check. Results are presented on table 3.7 on appendix 3.C and appear relatively stable, with a significant Phillips curve slope in all specifications but CEECs inside the EA.

[14]Instead of using year-on-year inflation rate, we test whether our results are robust to a quarter-to-quarter inflation rate. Such a measure suffers from a high level of seasonality, we introduce four lags of the dependent variable to partly get rid of it; results are presented in table 3.8 on appendix 3.C.

[15]In the rest of this section, CEECs will refer to Baltic states (i.e., Estonia, Latvia and Lithuania) plus Slovenia and Slovakia.

Table 3.2 – Main results

	(1) EA	(2) EU-15	(3) CEECs
Unemployment deviation	-0.00789**	-0.00921**	-0.0102*
	(-2.99)	(-3.11)	(-2.56)
Forecasted inflation	0.0110***	0.0114***	0.0197***
	(5.75)	(5.38)	(5.55)
L.Inflation rate	0.857***	0.863***	0.871***
	(36.10)	(34.00)	(30.48)
Crisis	0.00139	-0.000679	0.00452*
	(1.31)	(-0.70)	(2.07)
Observations	1113	940	344
R-sq	0.90	0.91	0.95
Endogeneity test	0.016	0.03	0.09

Notes: t statistics in parentheses; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
We estimate an IV estimator with both individual and temporal effects (not displayed in the table). All three columns estimate the Phillips curve using quarterly year-on-year inflation from 2000 to 2020, as a dependant variable. Column 1 refers to EA countries, by their respective date of accession; column 2 focuses on EU-15 to derive sub-group heterogeneities; column 3 introduces only the CEECs (i.e., Baltic states plus Slovenia and Slovakia), during the ERM-II and after their Euro adoption. Endogeneity test's p-value below 0.1 supports the IV estimator.

directly attribute monetary status changes,[16] to variation in the Phillips curve coefficient, as the adoption of the Euro as a currency, does not represent, in itself, a shock on the labour market. Countries in the ERM-II, already belong to the EU. In such a context, the EA accession is not expected to play a significant, role upon the wage dynamic.

On table 3.3, we distinguish respectively for column 1 to 3, the period before the EA, a specific focus on the ERM-II[17] and after the EA accession.[18] Columns 3 & 4 are estimated over the same time span to provide a comparison between the CEECs, after their EA accession and the EU-15.

We observe a relatively stable relationship upon foretasted inflation, as is the case for the

Table 3.3 – Exchange rate regime

	(1) CEECs before EA	(2) CEECs during ERM-II	(3) CEECs inside EA	(4) EU-15 after 2010
Unemployment deviation	-0.0179*	-0.0254**	0.00496	-0.00888*
	(-2.08)	(-2.79)	(0.69)	(-2.08)
Forecasted inflation	0.0225***	0.0283***	0.0130**	0.0119***
	(4.29)	(4.29)	(2.62)	(3.96)
L.Inflation rate	0.885***	0.931***	0.697***	0.742***
	(24.84)	(22.70)	(12.29)	(22.56)
Crisis	0.00207	0.00692***	0.00651***	0.0000755
	(1.35)	(3.50)	(4.23)	(0.07)
Observations	168	124	160	480
R-sq	0.96	0.97	0.87	0.86
Endogeneity test	0.09	0.14	0.10	0.02

Notes: t statistics in parentheses; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.
This set of estimation refers to the same equation as in the main table. We provide here a distinction upon the *stage* toward the EA accession. Using an IV process, in column 1, we focus on the CEECs before the EA (i.e., before and during the ERM-II for Baltic states and only during the ERM-II for Slovenia and Slovakia). In column 2, we focus only on countries belonging the ERM-II (recall we dropped out Denmark). In columns 4 & 5 we look at EA economies, by sub-group of countries. To allow time consistency comparison, in these last two columns, both time spans begin in 2010.

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[16]Changes in the status inside the EU, refer to ERM-II accession, followed by the EA entry.

[17]The time spent on the ERM-II is strongly heterogeneous among our group of five countries. Estonia remains 6.5 years, Lithuania 10.5 years and Latvia almost 9 years. Both Slovenia and Slovakia went through the ERM-II, during a shorter period of time, respectively 11 and 13 quarters.

[18]The relatively small number of observations, before the ERM-II entry, does not allow us to provide results on this specific status.

unemployment deviation coefficient. However, the Phillips curve slope coefficient is no longer significant after the CEECs entry the EA. As the coefficient remains significant, among the EU-15 and in line with the column 2 in table 3.2, i.e., the overall period, we need to disentangle this missing relationship in the specific case of the CEECs. As suggested by McLeay and Tenreyro (2020), the regional approach seems to give interesting results compared to estimation of the Phillips curve, in the aggregated EA.

Before going further, we need to test the robustness of these results. As Slovenia and Slovakia spent a small amount of time in the ERM-II stage, we run our set of estimations only looking at Baltic states to see whether our results are robust to any individual dimension change. Results, in table 3.9 on appendix 3.C are in line with previous estimation with a not-significant Phillips curve slope once countries join the EA. Moreover, our results also appear to be robust to the introduction of the output gap, à la Ball and Mazumder (2019), as a measure of economic slack, instead of the usual unemployment gap (see column 1 & 2 of table 3.10 page 110). To follow Bell and Blanchflower (2018), under the assumption of a decreasing pressure on wages during under-employment period, we introduce a new variable. Instead of looking at the unemployment gap, we introduce the non-employment rate gap computed as deviation from the non-employment rate, itself defined as $1 - \frac{employment}{working-age-population}$. Doing so we capture any variation in the participation rate.[19] This new approach does not lead to any conclusive result before or after the adoption of the Euro as a currency (table 3.10). Unconclusive results, concerning underemployment issue, in the CEECs are not surprising as underemployed part-time share among the working age population is relatively small in the CEECs compared to the rest of the EU.[20]

Between 2008-2010, we observe a temporary shock, in Latvia and Lithuania, in the EMU convergence rate, such that we introduce this new variable into the model. More precisely, we look at the interest rate spread. The idea, behind the introduction of the interest rate spread, is to capture the potential impact of financial frictions and their subsequent impact on the Phillips curve Gilchrist et al. (2017). The results, available on table 3.11 in appendix 3.C, remain stable.

Under the hypothesis, that small open economies, only marginally impact, the monetary policy in the Euro area, we expect to find a significant Phillips curve coefficient, looking at EA economic leaders over the same period. We focus on the six first EU members, namely Belgium, France, Germany, Italy, Luxembourg and the Netherlands (table 3.4). To draw a coher-

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[19]Another interesting measure would have been to introduce the "involuntary temporary employment". However, we only get this at an annual frequency and involuntary temporary employment (as is the case for part-time employment) is relatively low in the CEECs compared to EU-15 such that we do not go further in this direction.

[20]Source: Eurostat [lfsi_sup_q], from 2010 to last data available, the share of part-time underemployment in working age population is twice bigger in the EU-15 (4%) than in the CEECs (2%).

Table 3.4 – Leaders economies

	(1) EU-6	(2) EU-6 x DE	(3) Other EU-15
Unemployment deviation	-0.0133***	-0.0120**	-0.0113
	(-3.97)	(-3.16)	(-1.76)
Forecasted inflation	0.00288	0.00318	0.0169***
	(1.11)	(1.30)	(10.82)
L.Inflation rate	0.829***	0.783***	0.601***
	(18.03)	(16.95)	(11.31)
Observations	240	200	160
R-sq	0.84	0.85	0.87
Endogeneity test	0.09	0.08	0.04

Notes: t statistics in parentheses; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.
This set of estimation focus on EU-6 (with and without Germany) and other EU-15 economies to test our assumption under which, economic leaders may indirectly drive the ECB monetary policy. As in the main estimation, we use an IV estimator (endogeneity test support the presence of endogeneity in our series).

ent comparison, we restrict our time dimension from 2010 to 2020 and find a still significant Phillips curve coefficient, closed to what has been found in previous results. Such a significant negative coefficient holds even when we drop Germany from the panel (column 2 of table 3.4). Looking at other EU-15 countries, we do not find a significant result, which tends to support the important role of economic leaders, in the ECB monetary policy design.[21]

According to Schmitt-Grohé and Uribe (2016), currency peg and free capital mobility create negative externalities, in case of nominal wage rigidities. They propose to introduce some controls, upon capital flows, to limit the impact of such externalities. However, in the EU context, the free capital movement prevent such a solution.

Once countries belong to the monetary union, at the frontier of a fiscal union, government spending and/or fiscal deficits shall be used as smoother instruments in case of economic shock (Farhi and Werning, 2017). Our previous results implicitly state that small open economies, in a monetary union, without a fiscal counterpart, shall strongly rely on robust budgetary/fiscal tools to drive their economy. Such results tend to corroborate Del Negro et al. (2020) upon the role of labour market institution.

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[21] Under another approach, we derive a South-North heterogeneity, to capture the relative monetary prodigality against austerity. However, this heterogeneity did not end up to any conclusive results.

3.7 Conclusion

Recent EU non-Euro members agreed on the adoption, in the middle term, of the Euro, as a currency. From EU adhesion to EA accession, the ERM-II represents a voluntary mandatory step to ensure the country is ready to enter the EA. This represents a step toward the loss of the monetary policy where economies pegged their money to the Euro.

In light of the Phillips curve, which considers the monetary efficiency according to the relationship between inflation and unemployment, we question in this paper whether the switch from different exchange rate regime, leads to variation in the Phillips curve coefficient.

We use recent work from Jorda et al. (2018) and McLeay and Tenreyro (2020), to construct a panel of countries inside the EU and to deal with identification issue, usually found in the Phillips curve literature.

We have found that during the ERM-II, the Phillips curve coefficient is as expected, negative and significant. However, after the EA accession, the coefficient becomes not significant. This result is robust to changes in the definition of our variables, using different measure of economic slack and/or inflation.

To drive the monetary policy of the EA, the ECB reacts, to any change, in the weighted average of economic slack. An idiosyncratic shock won't lead to monetary reaction. We look at the Phillips curve among EA members and provide a heterogeneity distinction, between the "economic leaders" and other EU-15 countries. This last approach corroborates our main results. The Phillips curve coefficient is only significant for economic leaders.

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Appendices for chapter 3

3.A   Unit-root test results

Table 3.5 – Unit root test results

Variable	Nb. Obs.	Nb. groups	Lags	Test stat. $\bar{W}_t$	P-val. for $\bar{W}_t$
HICP	1290	17	0.7	-5.38	0.00
Unemployment	1290	17	0.7	-7.19	0.00
Expected inflation	1270	17	0.82	-6.45	0.00

Panel unit-root tests have been performed using the Im-Pesaran-Shin test (IPS) (2003), under the null that all panels have a unit root. According to the debate upon panel unit-root tests, other statistical analysis have been implemented (e.g., Maddala and Wu (1999) and Pesaran (2007) tests). Whatever the implemented test, we systematically reject the null hypothesis of unit-root in our series.

3.B   Some figures about EU stages

Table 3.6 – Country sub-groups

EU-15 - EA members					
Country	Code	EU	EA		
Austria	AT	1995	1999		
Belgium	BE	1958	1999		
Germany	DE	1958	1999		
Greece	EL	1981	2001		
Spain	ES	1986	1999		
Finland	FI	1995	1999		
France	FR	1958	1999		
Ireland	IE	1973	1999		
Italy	IT	1958	1999		
Luxembourg	LU	1958	1999		
Netherlands	NL	1958	1999		
Portugal	PT	1986	1999		
EU-15 - non-EA members					
Country	Code	EU	FX		
Denmark	DK	1973	ERM (1999-)		
Sweden	SE	1995	Floating		
United Kingdom	UK	1973	Floating		
CEECs - EA members					
Country	Code	EU	ERM	EA	FX
Cyprus	CY	2004	2005(June)	2008	Pegged
Estonia	EE	2004	2004(August)	2011	Pegged
Lithuania	LT	2004	2004(August)	2015	Pegged
Latvia	LV	2004	2005(August)	2014	Pegged
Malta	MT	2004	2005(June)	2008	Pegged
Slovenia	SI	2004	2004(August)	2007	Flexible
Slovakia	SK	2004	2006(January.)	2008	Flexible
CEECs - non-EA members					
Country	Code	EU	FX		
Bulgaria	BG	2007	Pegged (ERM 2020)		
Czech Republic	CZ	2004	Floating		
Croatia	HR	2013	Floating (ERM 2020)		
Hungary	HU	2004	Floating (pegged until 2008)		
Poland	PL	2004	Floating		
Romania	RO	2007	Floating		

Notes: "EU" refers to the European Union, "EA" to the Euro Area", "ERM" to the Exchange rate mechanism and "FX" to the exchange rate regime.

3.C Robustness

Headline inflation

Table 3.7 – Headline inflation

	(1) EMU	(2) EU-15	(3) CEECs	(4) CEECs ERM-II	(5) CEECs EMU
Unemployment	-0.00504*	-0.00750**	-0.0135**	-0.0354***	0.00693
	(-1.98)	(-2.71)	(-2.69)	(-3.80)	(0.92)
Forecasted inf.	0.0116***	0.0124***	0.0212***	0.0263***	0.0100
	(6.16)	(6.69)	(4.82)	(3.77)	(1.40)
L.Inflation rate	0.852***	0.852***	0.871***	0.927***	0.721***
	(41.57)	(38.06)	(30.27)	(23.19)	(13.74)
Crisis	0.00399**	0.00235	0.00109	0.00468	0.00957*
	(2.80)	(1.82)	(0.30)	(1.49)	(2.39)
Observations	1113	940	344	120	160
R-sq	0.94	0.94	0.96	0.97	0.94

Notes: t statistics in parentheses; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.
Columns 1-3 refer to the same estimation as in table 3.2; the two last estimation correspond to columns 4-5 of table 3.3. To follow Blanchard et al. (2015), headline inflation correspond to overall HICP. This new inflation measurement do not bring new results and confirm the lack of significant Phillips curve in the last estimation. We reject the idea that inflation measurement significantly drive our results.

Month to month inflation rate

Table 3.8 – Month to month data

	(1) EMU	(2) EU-15	(3) CEECs	(4) CEECs ERM-II	(5) CEECs EMU
Unemployment deviation	-0.0281**	-0.0320**	-0.0357*	-0.0754*	0.0172
	(-2.98)	(-3.07)	(-2.36)	(-2.05)	(0.66)
Forecasted inflation	0.0410***	0.0435***	0.0657***	0.0722**	0.0445*
	(6.18)	(5.96)	(4.87)	(2.89)	(2.38)
L.Inflation rate	-0.0756	-0.0584	-0.0127	0.244*	-0.264***
	(-1.78)	(-1.15)	(-0.26)	(2.07)	(-4.16)
L2.Inflation rate	0.122***	0.156***	0.0815	0	-0.140*
	(3.76)	(4.27)	(1.50)	(.)	(-2.43)
L3.Inflation rate	-0.202***	-0.210***	-0.128**	-0.0197	-0.323***
	(-6.15)	(-5.20)	(-2.86)	(-0.25)	(-5.13)
L4.Inflation rate	0.548***	0.529***	0.569***	0.446***	0.472***
	(18.80)	(15.79)	(10.86)	(3.71)	(6.20)
Crisis	0.0114**	0.00510	0.0196*	-0.00526	0.0260***
	(2.72)	(1.21)	(2.38)	(-0.28)	(4.37)
Observations	1083	907	335	118	160
R-sq	0.84	0.85	0.78	0.77	0.88
Endogeneity test	0.019	0.003	0.12	0.21	0.051

Notes: t statistics in parentheses; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

I present here results using the annualised quarter to quarter inflation rate using four lags to deal with the seasonality issue. Results strongly follow what is found in the main estimation or even the one found with headline inflation in table 3.7.

Baltic states

Table 3.9 – Exchange rate regime in Baltic states

	(1) Baltic states before EA	(2) Baltic states inside ERM-II	(3) Baltic states EA
Unemployment deviation	0.0620**	0.0819*	0.0525
	(2.59)	(2.18)	(1.47)
Forecasted inflation	0.0399***	0.0485***	0.000815
	(4.97)	(4.62)	(0.12)
L.Inflation rate	0.755***	0.727***	0.842***
	(16.08)	(10.53)	(5.72)
Crisis	-0.00216	-0.00410	
	(-1.01)	(-1.07)	
Observations	144	99	68
R-sq	0.98	0.98	0.65
Endogeneity test	0.09	0.071	0.016

Notes: *t* statistics in parentheses; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.
To derive any country heterogeneities among the CEECs, in this table, we run the same set of estimation, using an IV process, as in table 3.3 but only looking at Baltic states (Estonia, Latvia and Lithuania), respectively, before EA entry, during the ERM-II and after the Euro adoption.

Output and non-employment

Table 3.10 – Output gap and non-employment

	(1) CEECs ERM-II	(2) CEECs EA	(3) CEECs ERM-II	(4) CEECs EA
GDP	0.335** (2.58)	0.0918 (1.06)		
Non employment			-0.152 (-1.36)	-0.0896 (-0.64)
Forecasted inflation	0.00583 (1.07)	0.00497 (1.06)	0.0177*** (3.89)	0.00644 (1.45)
L.Inflation rate	0.762*** (9.86)	0.871*** (15.14)	0.905*** (22.61)	0.858*** (15.60)
Crisis	0.00927** (3.18)		0.00260 (0.74)	
Observations	112	92	120	116
R-sq	0.96	0.82	0.96	0.83

Notes: t statistics in parentheses; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

These two sets of estimations refer to column 4 & 5 of table 3.3. Columns 1-2 look at the GDP deviation, we find a positive and significant coefficient as expected only in the first case. Looking at the non-employment rate, any significant results are found. Such a result do not corroborate the decreasing wage pressure from Bell and Blanchflower (2018).

Financial integration during the sovereign debt crisis

Table 3.11 – Interest rate spread

	(1) CEECs ERM	(2) CEECs EA	(3) CEECs ERM	(4) CEECs EA
Unemployment deviation	-0.0571***	0.00209	-0.0571***	-0.00215
	(-5.27)	(0.24)	(-5.32)	(-0.24)
Forecasted inflation	0.0305***	0.0186**	0.0312***	0.0177**
	(4.43)	(3.25)	(4.27)	(3.22)
L.Inflation rate	1.018***	0.701***	1.021***	0.698***
	(26.87)	(10.64)	(26.05)	(10.56)
Crisis	0.00754***	0.00726***	0.0225***	
	(4.07)	(4.93)	(3.38)	
Spread			0.0329	0.121
			(0.55)	(1.78)
Observations	89	124	89	124
R-sq	0.98	0.89	0.98	0.89

Notes: t statistics in parentheses; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.
This set of estimation refers to the same equation as in table 3.3. We introduce a measure of interest spread to consider financial frictions. Columns 1-2 estimate the same equation as before on the CEECs, dropping Estonia, to allow comparison between the two groups (this new subgroup count for Latvia, Lithuania, Slovenia and Slovakia. Our spread variable is introduced in columns 3-4.

To compute the interest spread, we refer to the difference between the domestic and the German long term interest rate.[22] As no data are available for Estonia, to allow comparison between subgroups, in table 3.11, we first run the same estimation as in table 3.3 (columns 1-2) and then introduce our spread measure (column 3-4).[23] The introduction of this new measure do not change the lack of significant Phillips curve slope after the countries entered the EA such that we may exclude financial shocks to blur our results.

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[22] Source: Eurostat - "Long term interest rate, used as a convergence criterion for the EA, based on the Maastricht Treaty." No data are available for Estonia.

[23] We alternatively look at column 3 with or without the crisis dummy. Omission of this dummy do not change the results and as the coefficient is statistically significant, we present the results with the crisis dummy.

3.D   Variables definition

Inflation: From OECD database, we extract the consumer prices index at a quarterly frequency, using the growth rate compared to the same period, the previous year to blur seasonality in the series as series are not seasonally adjusted. We focus on headline inflation i.e., the index excluding food and energy.

Unemployment: From OECD key short-term economic indicators, we extract the standardized unemployment rate (all persons), seasonaly adjusted, in percentage of the labour force, at a quarterly frequency.

Forecasted inflation: We use the consumer survey, from the European Commission, conducted by the Directorate General for Economic and Financial Affairs (DG ECFIN) for different sectors of the economies. We focus on total consumer answers, to the price trends, over the next 12 months, balanced and seasonally adjusted.

4 Employment, unemployment and participation: a regional study

This chapter has been presented at the INFER conference, Paris, 2020

4.1 Introduction

The Europe 2020 growth strategy aims at a greater coordination of national policy in the European Union. Set for a ten-years period in 2010, one of the five main pillars states a six percentage points (pp) increase in the employment rate of the 20-64 years-old population (from 69% to 75%). During the 2010-2018 period, the employment rate increased on average in EU-28, to 73.1%. The boost was particularly impressive in Central and Eastern European Countries (henceforth CEECs), where it increases from 65.5% to 74.3%. In comparison, it grew by less than 3.5 percentage points (pp) in the EU-15 group. While employment level expands, by five percent in both group of countries, the denominator of the employment rate, the working age population, remained stable in the EU-15 group and decreased by six percent in CEECs. From this perspective, the employment rate change in the CEECs seems to be relatively labour supply driven compared to the change in the EU-15 group.

It is in this specific context that we find interesting to look at the dynamical changes upon the labour markets in the CEECs and to draw a comparison with the EU-15 economies. Indeed, the CEECs labour markets functioning are almost systematically pointed out in the country specific recommendations of the 2018 European Semester.

The purpose of this paper is to disentangle the labour market's mechanisms, when an exogenous shock affects the level of employment. We revisit the Blanchard et al. (1992) approach and observe how an employment innovation is absorbed on the labour market. Focusing on the employment, unemployment and participation rates, we expect a positive innovation on

the labour demand to temporarily stimulate the labour force participation rate and decrease the unemployment rate, ending up with a permanent higher level of employment.

Our contribution in this field is threefold. First we update and enrich the work of Gacs and Huber (2005) who covered the 1992-1998 period. We are convinced that looking at the period after 2000 may give some new insights and allows us to deal with harmonized data at the regional level (NUTS-2). The focus on the 1999-2017 period avoids structural reforms, following the transition in the nineties, to deteriorate our estimations leading to identification issues.

Second, we implement a robust comparison between the CEECs and the EU-15 group to understand whether the different labour markets tend to converge in terms of labour market response following an exogenous shock. Similar reactions could give weight to the European employment policy efficiency.

Last, following EC (2018), who highlight regional labour market heterogeneity and an increasing gender gap issue on the labour market, we provide different sets of analysis to understand the regional behaviours. We alternatively look at the risk of poverty, the share of employment in the different sectors, the budgetary decentralisation and the gender distinction. This last approach supports the IMF and the Europe 2020 strategy recommendations concerning the weak Women labour force participation in the CEECs.

Following a positive shock imposed on the labour market, the level of employment permanently reaches a higher level; while both participation and unemployment rates impacts fade out within a decade. Drawing a comparison between the EU-15 and the CEECs, we find a relative more persistent response of the unemployment rate in the last group. By construction, the employment innovation is absorbed through wages and unemployment adjustments. The employment level ends up at a slightly higher level in the CEECs. This reflects a more efficient unemployment channel and underlies a relative more responsive labour supply in case of employment shock.

The relatively weaker wage channel leads to a higher shock persistence in poorer regions and in regions with a high share of agricultural employment. This corroborates the necessity to focus on infrastructure's investment and education. No differences are found according to the budgetary decentralisation. A specific focus on the participation rate dynamics allows us to exacerbate the women vulnerability in the CEECs but also its negative impact on the long-term employment level. We so pointed out, the necessity to implement reforms favouring women labour force participation rate for example thanks to childcare program in order to target the most at-risk population in case of employment shock.

Section 2 of this paper gives an overview of the existing literature. Section 3 describes

the data and presents some stylized facts. Section 4 proposes the empirical strategy while section 5 presents the main results. Then, the rest of the paper is divided in two sections; section 6 discusses the results and the last section concludes.

4.2   Literature review

The transition process in the CEECs started in the nineties and implied a new-born unemployment induced by restructuring, privatizations and a labour to capital substitution (Aghion and Blanchard, 1994; Blanchard, 1998). Looking at transition economies in Europe and Central Asia, Rutkowski (2006) highlighted a correlation between the restructuring and the drop in the observed employment rate. According to Bornhorst and Commander (2006) and Münich and Svejnar (2007), focusing on the first decade of the transition in the CEECs, the production factors substitution was not followed, in the short run, by a net creation of employment. At the same, labour market institutions, mostly through their non-employment benefits programs [1], do not stimulate labour mobility, leading to regional disparities and weak wage adjustment (Boeri and Scarpetta, 1996). Using a four-countries panel (Bulgaria, Czech Republic, Hungary and Ukraine) at the NUTS-3 level, in 2001, Jurajda and Terrell (2009), pointed out the weak labour mobility induced by the low efficiency of labour market institutions to explain the lack of convergence of the unemployment rates across regions.

According to Campos and Coricelli (2002) the low labour mobility across regions, significantly impacts the persistence in high unemployment rate and the weak participation rate. Fidrmuc (2004), using data on Czechia, Hungary, Poland and Slovakia, covering the 1992-1998 period confirm a regional mobility issue.

Empirical analyses, from Svejnar (1999) and Huber (2007), looking at the regional dimensions, highlight an improvement of labour market conditions, only in economic centres and regions geographically closed to the EU-15 (i.e., sharing a common border with western European countries). Gacs and Huber (2005), looking at a panel of CEECs NUTS-3 regions, draw a comparison between rural and urban labour market adjustments. They analysed changes in employment and the impact on unemployment and the participation rate. They found rural regions to be left behind. Regions, away from economic centre, do not take advantage neither from economic development nor from public or private investments.

According to Marelli et al. (2012) or Rios (2016), this regional heterogeneity is still present. Over a more contemporaneous period, they disentangle the labour market evolution before and after the 2008 economic crisis. They draw a spatial analysis in both EU-15 and CEECs

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[1] Non-employment benefits consist for example on unemployment benefits, early retirements programs, welfare assistance.

groups and found a persistent heterogeneity in regional labour market response aftershocks. Nevertheless, the labour market institutions play a significant role in regional development (Di Cataldo and Rodríguez-Pose, 2017). In the CEECs, compared to Former Soviet Union economies, Boeri and Terrell (2002) found they tend to foster the transition process. This corroborates Huber (2004) looking at the evolution of regional labour markets in the CEECs before their accession to the European Union.

The fog on the labour market developments in CEECs may also be explained by a skill-mismatch problem implying a relative more persistent unemployment compared to Central Asian transition economies which suffered more from underemployment (Rutkowski, 2006). The new private labour demand does not fit the labour supply. Dealing with a survey of 921 firms concerning Hungary, Romania and Russia in 2000, Commander and Kollo (2008) look at the inadequacy between a low skilled labour supply versus a high educated labour demand. They found a correlation between the skill-mismatch persistence and both education spending and education quality to explain the duration of the weaknesses of the labour market.

However, the observed recent fall in the unemployment rate, confirm León-Ledesma and McAdam (2004) who reject the hysteresis hypothesis even during the first decade of the transition.

4.3 Data

4.3.1 Data description

This study considers a regional approach at the European level (28 countries). Two main groups of countries are analysed. The first group includes the EU-15 states, i.e., the fifteenth first EU members while the second group focus on CEECs. We use the EU-15 group as a benchmark to allow comparison inside the EU-28.

We adopt the use of NUTS-2 data, commonly used to analyse the EU labour market dynamics (Decressin and Fatás, 1995; Gacs and Huber, 2005; Halleck Vega and Elhorst, 2014; Beyer and Smets, 2015).

Data are extracted from Eurostat website[2] and cover the 1999-2017 period. As we are looking for regional interactions, we may not include in our database, countries with less than three NUTS-2 regions. We do not keep Ireland, Luxembourg, Cyprus and Malta. In the EU-15 group, we drop Finland and Denmark due to missing data. Greece has been removed because of few reliable data. Bulgaria, Croatia and Slovenia are also dropped because of missing data and

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[2]http://ec.europa.eu/eurostat/en/data/database

smaller time span. We integrate the Baltic countries (i.e., Estonia, Latvia and Lithuania) as a "single country" with three regions.

Moreover, autonomous regions from Spain, Portugal and Italy are excluded (it concerns Ceuta, Melilla, Acores, Madeira and Aoste). Last, French overseas department and territories are also dropped out. Some other regions, not providing a complete information on the overall period, are kept aside. Last, when the geographical definition changed during the period, the concerned regions are also suppressed from our database. We end up, from 1999 to 2017, with 156 regions in EU-15 group and 45 in the CEECs group.

Data are collected thanks to the Labour Force Survey (LFS), at an annual frequency, such that the definition of the different variables are homogeneous for the whole panel. We focus on the regional working age population, employment and unemployment and consider the 15-64 yo population.[3] Each variable is expressed in thousands of persons. The working age population refers to every individual aged 15-64 yo at the time of the survey. Employment measure considers every person, 'member of the active population which has, at least, worked for one hour during the period under study or which is temporarily absent for work'.

Unemployment is measured thanks to the International Labour Office definition, i.e., persons who are not currently employed but actively looking for a job. Every variable is available by sex, to allow a gender heterogeneity in our analysis.

From the beginning of the period, the working age population decreased by almost seven percent in CEECs with the highest drop in Baltic states and Romania. Slovakia is the only one country in the CEECs to end up with a positive change in the working age population (+3,4%). Employment grew by less than two percent but hides a twelve percent drop in Romania against a thirteen percent increase in Poland.

The table 4.1 presents the main statistics of the three variables by sub-group. Thanks to the use of the regional level, instead of the country approach, the variables tend to be more homogeneous in level.[4] The average of each variable is at a slightly highest level in the EU-15 countries. The dispersion of the variables is smaller in the CEECs, this suggests a relatively weaker level of heterogeneity amongst CEECs regions compared to the EU-15 group. In both sub-groups, the coefficient of variation (CV) of unemployment is relatively bigger than the two other CV, even larger than one, suggestion a high level of heterogeneity in unemployment data. The regional dimension seems to be even more justified when looking at the unemployment level.

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[3]Source: Eurostat database; last update 18/03/2019; extracted on 21/03/2019; Working age population: lfst_r_lfsd2pop; Employment: lfst_r_lfe2emp; Unemployment: lfst_r_lfu2gac; it would have been interesting to also look at the 20-64 yo population nevertheless data at the regional level are not provided in this dimension.

[4]The tables 4.5 & 4.6 describe the variables per country. On average, EU-15 countries are almost three times bigger than CEECs in terms of working age population.

Table 4.1 – Regional main statistics by sub-groups

	Mean	SD	Min	Max	CV
CEECs					
Working-age population	1893.0	1280.2	435.6	7431	0.676
Employment	1133.1	787.6	296.2	5093.9	0.695
Unemployment	125.6	106.1	11.40	620.4	0.844
EU-15					
Working-age population	2004.4	1932.7	103.6	12036.3	0.964
Employment	1308.0	1243.6	53.90	8439.3	0.951
Unemployment	126.5	166.6	3	1717	1.316

Notes: The variables are expressed in thousand individuals, average by region by sub-group of countries, over the 1999-2017 period.

4.3.2 Stylized facts

Before going further, we compute the employment rate, defined as the ratio of employment over the working-age population; the participation rate, defined as the sum of employment and unemployment over the working age population; last the unemployment rate, which is the ratio of unemployment over the active population i.e., unemployment over the sum of employment and unemployment.

The employment rate in the CEECs is closed to but below the EU-15 level (table 4.2). However from 2010 to 2017, the employment rate reaches 91,66% of the working age population, 0.5pp higher than in the EU-15 group. In the CEECs, Czech Republic is the best performer with the highest employment rate (94.12%) and the lowest unemployment rate (5.88%). The unemployment rate slightly decreased at the end of the period, from 11.17% before 2010 to 8.34% . At the same time, it increases in the EU-15 sub-group (from 7.76% to 8.96%). Looking at the participation rate, we found a gap between the CEECs and the EU-15 countries. Despite an increasing trend, the participation rate in the CEECs remains below the EU-15 level.

The graphs (4.1) illustrate the evolution of the unemployment and participation rates in the CEECs compared to EU-15 average. If a region[5] lies over the solid line in the case of participation or at the left side concerning the unemployment rate, then we may consider

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[5]Each point refers to a NUTS-2 region in CEECs

Table 4.2 – Main statistics by group of countries

| | 1999-2017 | | 1999-2010 | | 2010-2017 | |
	Total	Women	Total	Women	Total	Women
Employment rate						
EU-15	91.72	91.03	92.24	91.13	91.03	90.91
CEECs	90.04	89.67	88.83	88.32	91.66	91.45
Participation rate						
EU-15	72.15	65.4	70.91	63.11	73.78	68.39
CEECs	66.67	59.73	65.56	58.77	68.14	61.01
Unemployment rate						
EU-15	8.28	8.96	7.76	8.86	8.96	9.01
CEECs	8..64	9.26	11.17	11.67	8.34	8.55

Notes: The variables are expressed in percentage.
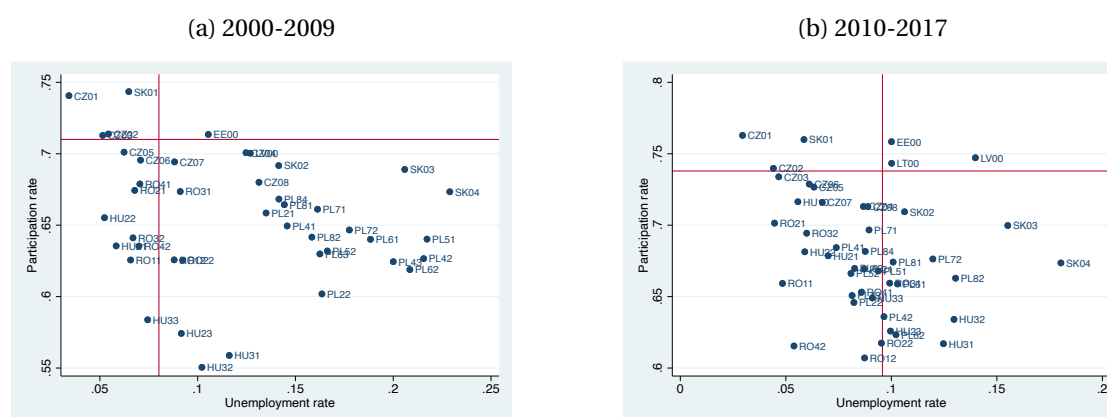
(a) 2000-2009

(b) 2010-2017

Source: Eurostat working age population
[lfst_r_lfsd2pop], employment [lfst_r_lfe2emp],
unemployment [lfst_r_lfu2gac]

Source: Eurostat working age population
[lfst_r_lfsd2pop], employment [lfst_r_lfe2emp],
unemployment [lfst_r_lfu2gac]

Figure 4.1 – Unemployment rate versus participation rate

Notes: Each point refers to a particular NUTS-2 region of the CEECs. The two axes represent the unemployment
and participation rates computed respectively as the ratio of unemployment to labour force and labour force to
working age population. The solid lines represent the EU-15 average over the same periods and allow to
understand how a region stands compared to the EU-15 (graph 4.1a focuses on the 2000-2009 period and graph
4.1b on the 2010-2017 period).

the country as a better performer than EU-15.[6] We observe kind of a 'convergence' in the unemployment rate as almost every country comes closed or just below the EU-15 average in the period 2010-2016 compared to the situation before 2010. Unfortunately, the changes in the participation rates are less conclusive. On the overall, CEECs remain below the solid line. These facts corroborate recent IMF and EC (2018) recommendations concerning the labour market changes that has to be implemented during the next years.

As highlighted in EC (2018) and observed in table 4.2 the positive changes in labour market variables, in the CEECs, hide a hard to fill gender gap. The women participation to the labour market remains a current issue. Despite an increasing employment rate among women and a decreasing unemployment rate, the gender gap in participation has been increasing up to almost 7.5pp, to a higher level than in EU-15, comparing period before and after 2010.

4.4 Empirical strategy

Blanchard et al. (1992) used a regional dimension to disentangle the interactions upon the US labour market. They formalized the US labour demand and supply and then confront their reactions in case of an employment shock. This seminal paper was reproduced by Decressin and Fatás (1995) looking at differences between the US and EU labour markets. More recently, two new contributions enriched the paper. Halleck Vega and Elhorst (2014) introduced spatial spillovers looking at the labour market dynamics in eight Western European countries from 2000 to 2011. Beyer and Smets (2015) used multi-level factor model, on the US labour market, to extract the regional dimension in the data.

The main advantage of the Blanchard et al. (1992) approach is to give an overview of the different behaviours on the labour market from both demand and supply sides. Moreover it allows to visualize the share of an employment shock, absorbed, in the long run, by the wages or by the unemployment. Eventually, the simulation of an exogenous employment innovation easily illustrates the employment level reaction and both participation and unemployment rates changes.

To capture the dynamic upon the labour market and to deal with the endogeneity amongst the variables of employment, unemployment and participation, we use a panel VAR. The model is written as:

$$Y_{it} = A_1 Y_{it-1} + ... + A_p Y_{it-p} + u_i + \mu_{ct} + \varepsilon_{it}, \ i = 1,...,N \ and \ t = 1,...,T \qquad (4.4.1)$$

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[6]solid lines provide the EU-15 average value on both participation and unemployment rates

where $Y_{it} = (y^1_{1t}, ..., y^K_{it})$ is a $(K * 1)$ vector of endogenous variables. The A_j correspond to the coefficients matrices and are on $(K * K)$ dimension . The vector $u_i = (u^1_i, ..., u^K_i)$ is a $(K * 1)$ vector of individual fixed effects and $\varepsilon_t = (\varepsilon^1_{it}, ..., \varepsilon_i t^K)$ is an i.i.d. residuals vectors with zero mean and fixed variance ($E(\varepsilon_{it} = 0)$; $E(\varepsilon_{it} \varepsilon'_{it} = \Omega . It = s)$ $\forall i\ and\ t$). The temporal and individual dimensions are respectively introduced through the t and i indices.

As we are implementing a panel approach at the European level, we have to deal with two different levels. The first one considers the different countries, member of the European union then the second level consists of the regional breakdown of these countries. The regional dimension will be considered thanks to the regional fixed effect introduced in our specification. Unfortunately, the country dimension may not be taken into account. To deal with this issue, we built a proxy of the country fixed effect using employment in all regions of the country, except the region under study. As we use all the other regions of a specific country and not only neighbouring regions, we do not count for regional spillovers but the common evolution in a specific country.[7]

The higher the number of regions, the more efficient the proxy will be. This point confirms the use of NUTS-2 data to the detriment of NUTS-1, less reliable in the context of our analysis. Obviously, countries with less than three NUTS-2 regions are excluded from our panel (exception concerning the three Baltic countries treated as a single country as previously mentioned):

$$\mu_{ct} = employment_{ct} - employment_{it} \ \ with \ employment_{ct} = \sum_{i=1}^{I} employment_{it}$$

where i the regional dimension, c the country level, t the temporal dimension and I the total number of regions inside the country c.

In panel specification, when the individual dimension (N=45 in the CEECS and N=156 in the EU-15 group) is overwhelming a fixed temporal horizon (here T=19), the least square dummy variables estimator (LSDV) leads to inconsistent estimation of the parameters of interest. With a dynamic panel, fixed effect estimator would be even less pertinent as fixed effect are correlated with the regressor due to the lagged structure imposed on the dependant variable. In this case, estimated parameters are biased. To counteract these issues, with use a GMM estimator, designed for a small temporal dimension over a larger individual one. We follow the method introduced by Arellano and Bover (1995) namely we implement the 'Helmert' procedure i.e. a forward mean-differencing (Love and Zicchino, 2006; Boubtane et al., 2013). This method uses the average of the future observations instead of the first difference and present the advantage of minimizing the loss of information which may be particularly

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[7]As for an example, we think that employment in Karlsruhe (south Germany) may not impact employment in Hamburg (North Germany), otherwise than by the German overall macroeconomic policies.

important in case of unbalanced panel (Roodman, 2009).[8] It also preserves the orthogonality and allows lagged regressors to be used as instruments.

We estimate a reduced form VAR model à la Blanchard et al. (1992) with three endogenous variables:

$$\Delta e_{rt} = \gamma_{r10} + \gamma_{11}(L)\Delta e_{rt-1} + \gamma_{12}(L)lu_{rt-1} + \gamma_{13}(L)lp_{rt-1} + \mu_c + \varepsilon_{r\rho t} \tag{4.4.2}$$

$$lu_{rt} = \gamma_{r20} + \gamma_{21}(L)\Delta e_{rt} + \gamma_{22}(L)lu_{rt-1} + \gamma_{23}(L)lp_{rt-1} + \mu_c + \varepsilon_{r\sigma t} \tag{4.4.3}$$

$$lp_{rt} = \gamma_{r30} + \gamma_{31}(L)\Delta e_{rt} + \gamma_{32}(L)lu_{rt-1} + \gamma_{33}(L)lp_{rt-1} + \mu_c + \varepsilon_{r\tau t} \tag{4.4.4}$$

where Δ_e refers to the employment growth rate measured as the first difference of the logarithm of the employment level; lu represents the logarithm of the employment rate computed as the logarithm of the ratio employment level to the labour force; last lp denotes the logarithm of the LFPR as the logarithm of the ratio of the active population over the working age population. We use r and c indices to deal with the region and the country levels. The t indices refer to the temporal dimension.

In the vein of Blanchard et al. (1992), we connect an exogenous innovation in relative employment within a year, with a change in labour demand ($\varepsilon_{r\rho t}$ in Eq. 4.4.2). This assumption may be correct until most of the unexpected change is not due do an exogenous labour supply shock or labour migration. In the reduced VAR form we follow (Decressin and Fatás, 1995) and impose the unemployment and participation rates to impact employment only after one lag. Doing so allows to trace the employment innovation impacts and interpret them as resulting from a labour demand shock.

As we want to understand the regional dynamic of the labour market variables, we have to separate the regional part of each variable from the national counterpart. To do so we use the CCEMG[9] estimator from Pesaran (2006). The common correlated effect is particularly convenient in case of fixed time panel. We do not replicate the approach of Blanchard et al. (1992), using a simple difference between the regional and the national counterparts of each variable. Indeed, as mentioned by Beyer and Smets (2015), European series may highlight a

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[8]Our panel present some gaps particularly when focusing on gender distinction.

[9]The common correlated effect mean group estimator has been used in a similar context by Halleck Vega and Elhorst (2016) & Halleck Vega and Elhorst (2017)

unit root in the employment rate and in the participation rate.

The estimator uses panel literature as well as time series with non-stationary variables, cross section dependence and heterogeneity in the parameters. It is a two-step approach of the mean group estimator; first a group specific estimation and then the average of the estimated coefficients. The CCEMG estimator includes unobservable time varying variables even with heterogeneous effect across panel members. Moreover, it deals with the identification issues, by including cross-sectional average by panels for dependent and independent variables. The residual of the CCEMG estimator is assimilated to the regional specific part of the variable. According to the Frisch-Waugh theorem, the use of demeaned variables prevents the introduction of temporal fixed effect, which would have encumbered our specification (Blanchard et al., 1992; d'Albis et al., 2018).

A dynamic panel VAR, even with the GMM estimator, requires the variables to be stationary. Indeed, in case of unit root, the GMM estimators cannot use strong instruments given the forward transformation. We follow Eberhardt and Teal (2011) and Eberhardt and Teal (2013) using Dickey-Fuller and augmented Dickey-Fuller tests with and without trend. First of all, we apply the Maddala and Wu (1999) test which consider autoregressive coefficient heterogeneity but ignore cross-sectional dependence in the data. Then, we use Pesaran (2007) tests as they include an unobserved common factor. Panel unit root tests are implemented on relative variables i.e. once the national counterparts have been dropped out from the series.

Results of the different tests confirm our variables of employment and participation rate to be stationary (table 4.7). As the unit root hypothesis is not strongly rejected according to these two tests, looking at the employment rate, we run a complementary set of tests.[10] The null hypothesis is systematically rejected even when introducing a trend or dealing with a different number of lags. We consider the employment rate variable to not suffer from a unit root.

Choosing the optimal lag order is necessary to draw an efficient panel VAR analysis. To select the number of lags in our model, we refer to the minimisation of the model-selection criteria developed by Andrews and Lu (2001) based on the overidentifying restrictions J statistic from Hansen (1982). Following a VAR estimation implemented to each region of the panel, the results suggest the use of one or two lags. Given the small-time span (only 19 points) we introduce one lag in our basic model.[11]

VAR model allows to trace the impacts of an employment shock, on employment, employment

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[10]We perform the Levin-Lin-Chu test (which assume a common autoregressive parameter), the Harris-Tzavalis test (more efficient when the time dimension is small), the IPS test (Im et al., 2003) (introducing heterogeneity in the panel) and Fisher-type tests (considering each panel individually).

[11]With three lags, our model is just identified. We draw the specification with two lags and found similar results in the CEECs (results figure 4.6 in appendix) group even if the individual dimension is small compared to the EU-15 group; given the higher number of observations in the EU-15 group, we prefer the use of two lags.

rate and participation rate. This is possible thanks to the impulse response functions (IRFs). The assumption by which, employment growth is made through a demand shock is implemented thanks to orthogonal shocks. Indeed, to draw the dynamic response of the different variables in the model (Impulse response functions), the errors have to be orthogonal. As the variance-covariance matrix from estimated errors may not be diagonal (i.e. errors are correlated), residuals have to be decomposed to get them orthogonal.

The Cholesky decomposition is the usual way to assess such issue. By ordering the variables in the specification, we impose a simulated innovation to contemporaneously impacts the variable itself and the following variables included in the model. If follows that a variable coming later in the specification impacts the previous variables with one lag. Such a decomposition allows the variance-covariance matrix to be diagonal. By orthogonalizing the response we are able to identify the effect of one shock at time zero on a precise variable, while holding others constant.

In line with the literature, we order first the employment growth rate, such that it impacts contemporaneously employment growth rate itself, the employment rate and the participation rate. As a robustness check, we modify this order and found similar results (figure 4.6).[12] We will now trace out an employment innovation (a one standard deviation shock is imposed on $\varepsilon_{r\rho}$) to understand the labour dynamics on the three variables included in our specification. Once the impulse responses, subsequent to a shock on the labour demand, are estimated, it is easy to transform the results to get an estimated response of the unemployment and the participation rates. Indeed, we do not include specifically the unemployment and participation rates. We have introduced the logarithm of the relative employment rate as an indirect measure of the relative unemployment rate. We also used the logarithm of the relative participation rate. Following Blanchard et al. (1992) & Decressin and Fatás (1995), we consider $le_{rt} \approx -U_{rt}$[13], such that we can transform our results to get the appropriate responses after the simulated shock.[14]
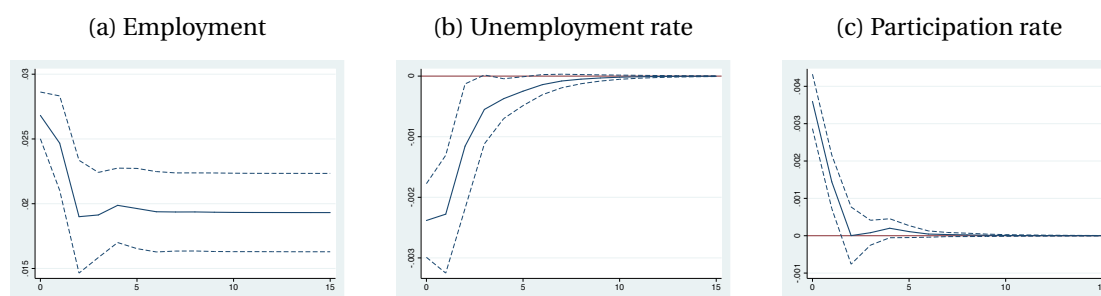
Figure 4.2 – IRFs - CEECs - shock on employment

Note: The solid lines are the impulse response functions whereas, the dashed lines represent the 95 percent confidence interval; Results simulate a one standard innovation shock on employment; Errors are generated with 500 repetitions of Monte Carlo.

4.5 Results

The figure 4.2 presents the impulse response function concerning employment level, unemployment and participation rates, following a one standard error innovation in the employment growth rate. We focus here only, on the CEECs group. The level of employment is expected to highlight a long-term deviation while the unemployment and participation rates are expected to return to their previous level.

Following the initial spike on employment (graph 4.2a), the variable slowly decreases, reaching a new plateau corresponding to a permanent higher level of employment, around a two percentage points (pp) long-term increase. After a fifteen-projection simulation, the plateau reached by employment represent 80% of the initial impact (2,2pp against 2,7pp).

We expect a temporary negative reaction of the unemployment rate in the aftermath of a positive drift in employment, while the LFPR is expected to increase (graph 4.2b & 4.2c). Results are consistent with these predictions and show a 0.2 pp drop in the unemployment rate and a 0.3 pp increase in the LFPR at the moment of the shock. Both variables go back to their long-term trajectory. Like Gacs and Huber (2005), the duration of the unemployment rate response is slightly longer than the participation one. Indeed, the participation rate (on the

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[12]We checked the stability of our VAR model by controlling if all the modulus of each eigenvalue lie in the unit circle. The stability condition is necessary to draw the impulse response function and the forecasted error decomposition.

[13]Given U, E, L respectively the level of unemployment, employment and labour force, we can pose: $u = U/E \approx ln(1 + U/E) = ln(L) - ln(E)$ thus $(n^* - u) \approx ln(L) - ln(L) + ln(E) = ln(E)$ with u the unemployment rate defined as the ratio of the unemployment to the employment and n^* the logarithm of the labour force.

[14]See Blanchard et al. (1992): $d(U/L) = (E/L)(d(-ln(E/L)))$ and $d(L/P) = (L/P)dln(L/P)$ where U refers to unemployment, E to employment, L to labour force and P to the working age population.

lower left graph) returns to its long-term trajectory within six years. The unemployment rate response becomes non-significant after four years at a 95% percent confidence interval.

The VAR model allows to decompose the variance of the different forecasted variables fol-

Table 4.3 – FEVD - Projection after 15 years

	CEECs	EU-15
Employment	87.2	92.24
Unemployment rate	5.07	10.02
Participation rate	12.51	24.47

Notes: Numbers are expressed in percentage of the total variance and represent the role of the employment variable to explain the variance of the other variable ; Employment shock simulation; 15 years projection ahead.

lowing the shock (table 4.3). The variance decomposition is an interesting way to apprehend to what extend a variable plays a role in explaining the variability of another variable; this is the forecasted error variance decomposition (FEVD). In the middle-long-term (i.e. up to 15 years of projection), the shock on employment explains around 8% of the unemployment rate variance while it explains 15% of the LFPR variance.

The figure 4.3 presents the impulse response functions for the EU-15 countries, estimated

(a) Employment   (b) Unemployment rate   (c) Participation rate

Figure 4.3 – IRFs - EU-15 - shock on employment

Note: The solid lines are the impulse response functions whereas, the dashed lines represent the 95 percent confidence interval; Results simulate a one standard innovation shock on employment; Errors are generated with 500 repetitions of Monte Carlo.

after a one standard deviation innovation on employment. The level of employment reaches a long run plateau within five to seven years after the shock; during this period, around 25% of the initial shock disappears. The response of unemployment and participation are similar to the previous group. The participation rate goes back to its long-term trajectory within three

years. The response of the unemployment rate is longer in duration. Indeed, it takes roughly a decade to fade out.

These results, despite not being identical, are quite similar to Decressin and Fatás (1995) or Beyer and Smets (2015). Nevertheless we find a higher plateau in employment level compared to Beyer and Smets (2015). Indeed, they find a long-term employment level corresponding to 50% of the initial shock while we estimate a 75% plateau in the EU-15.

Moreover, we observe tighter confidence intervals in case of EU-15 countries. This may be justified by a higher cross-section in the EU-15 group, allowing more robust estimation and a more homogeneous average response among the different regions.

The share of the variance explained by the shock on employment (FEVD) is higher for both the unemployment and the participation in case of the EU-15 group, respectively 18.6 and 25.8 percent. A stronger sensitivity in the EU-15 group reflects a relatively higher level of interconnection between variables upon the labour market.

As we observed an overall decrease in unemployment rates in the CEECs during the last

(a) Employment -
High at-risk of poverty rate

(b) Unemployment rate -
High at-risk of poverty rate

(c) Participation rate -
High at-risk of poverty rate

(d) Employment -
Low at-risk of poverty rate

(e) Unemployment rate -
Low at-risk of poverty rate
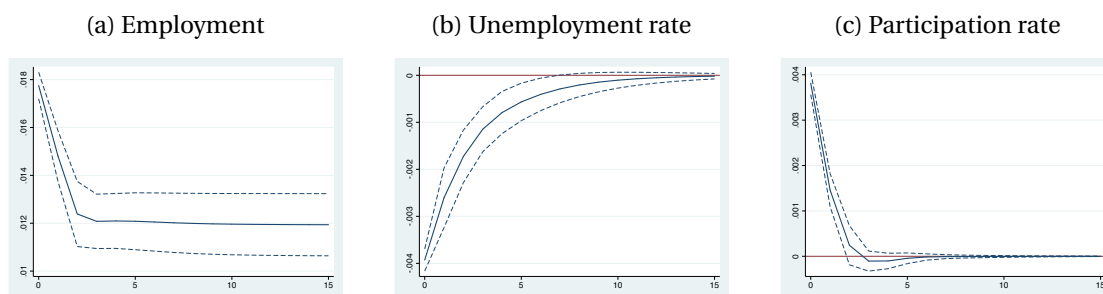
(f) Participation rate -
Low at-risk of poverty rate
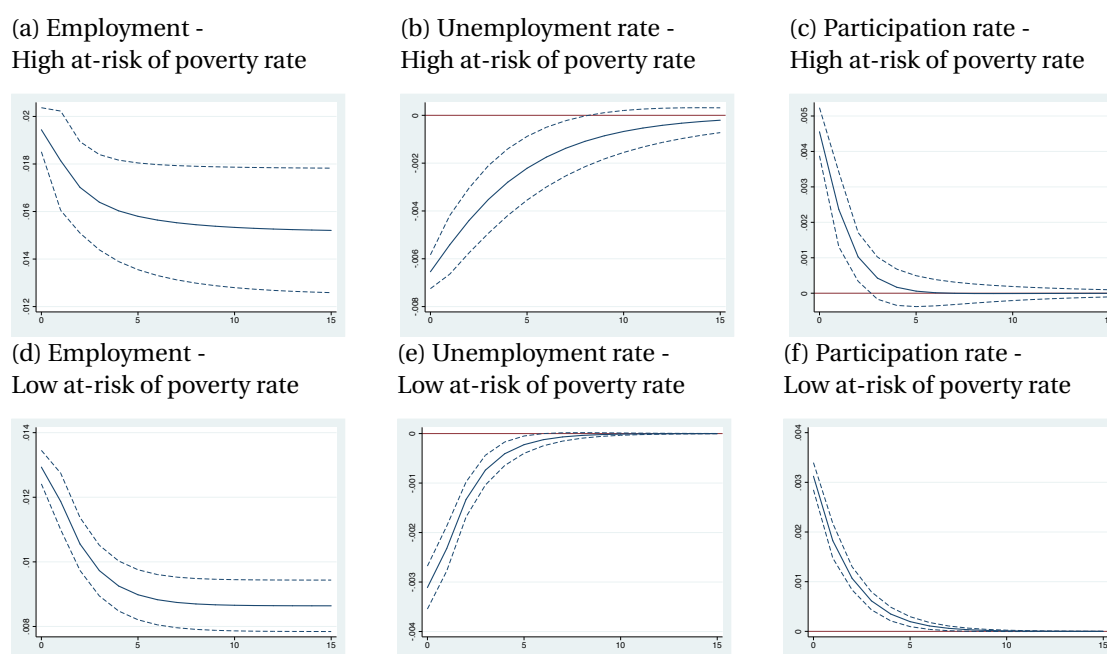
Figure 4.4 – IRFs - by at-risk of poverty rate

Note: The solid lines are the impulse response functions whereas, the dashed lines represent the 95 percent confidence interval; Results simulate a one standard innovation shock on employment; Errors are generated with 500 repetitions of Monte Carlo.

decade but increasing disparities, we re-consider the Gacs and Huber (2005) regional het-

erogeneity. We implement the model upon different sub-groups to capture heterogeneous response. We draw a comparison according to the risk of poverty. To do so, using the same panel as before, we use the "At-risk of poverty rate" average[15] in the EU and create two sub-groups of regions, below and higher than the average. We end up with two sub-panels, with 33 regions with a lower-than-average rate and 57 regions upon it. Results are similar to the previous one (figure 4.4). Nevertheless, the return of the unemployment rate toward its long-term trend takes more time in regions with a higher "at-risk of poverty" while the participation rate hike disappears two years after the shock. The long-term plateau in employment is 12 pp higher in "high at-risk of poverty" regions. Given this new approach, we do not separate responses according to the EU-15 and CEECs group as the number of observations would be too low to get interesting results.

We also consider the share of employment in different sectors (NACE-2) to proxy the "urban/rural" dichotomy found in Gacs and Huber (2005). We count 79 regions with a share of employment in agriculture above the EU average. These regions are introduced as "rural regions". The behaviour of the different variables is similar as before with a quick response in the participation rate, a longer duration in unemployment response but a higher employment level in "more agricultural regions".[16] Not surprisingly, employment shock persistence is relatively lower in regions with a high employment share into high technology sector.

 As we have mentioned earlier, the women labour market participation is an issue in the CEECs as the gap between men and women is increasing while in the EU-15 countries, the distance declined. Following this, it is interesting to look at the previous model, but focusing on the LFPR response separately for men and women. We draw the same model but splitting the participation in two variables. Women and men LFPR are simultaneously introduced to avoid omitted variable bias.

Following a positive shock on employment, the dynamic of the response seems to be more persistent when looking at the women participation rate in the CEECs compared to the men participation in the same group but not to the women participation in EU-15, where results are almost identical. The shock disappears between three to four after the innovation.

To go further, we have a specific look at regions where the women participation rate is below the EU average. This new panel consider 85 regions with a lower-than-average women participation. The results remain similar (figure 4.5) but indicate a lower long-term employment

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[15]Eurostat database

[16]Data on the urban/rural dichotomy are available at the NUTS-3 level. However, given our strategy, results were not enough reliable as the nuts-3 data were aggregated at the country level, decreasing the number of observations below a critical level. Only data concerning metropolitan nuts-3 level were consistent but up to this disaggregated level, underlying mechanisms are hard to be identified and should be influenced by other channel, we are not interested in, like commuting

(a) Employment -
High women participation
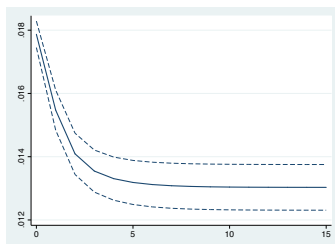
(b) Unemployment rate -
High women participation
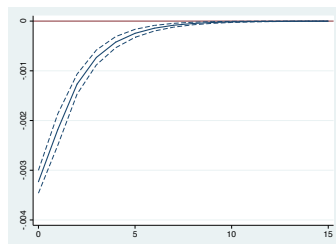
(c) Participation rate -
High women participation
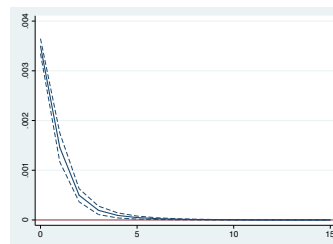
(d) Employment -
Low women participation
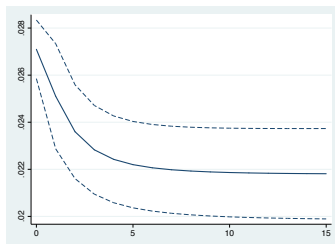
(e) Unemployment rate -
Low women participation
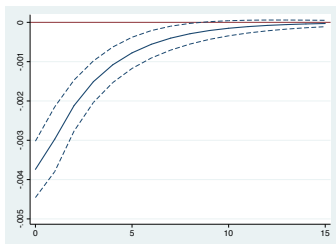
(f) Participation rate -
Low women participation
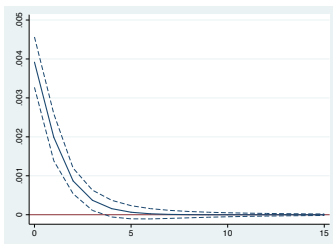
Figure 4.5 – IRFs - by women participation level

Note: The solid lines are the impulse response functions whereas, the dashed lines represent the 95 percent confidence interval; Results simulate a one standard innovation shock on employment; Errors are generated with 500 repetitions of Monte Carlo.

level than in other regions (respectively 77% against 74%).[17]

4.6   Discussion

The model of Blanchard et al. (1992), described in appendix 4.A, ends up with two mechanisms at stake, following a negative innovation on the labour demand. A change in employment induce wages[18] and unemployment to vary over time. A negative shock on employment induces wages to decrease (see Eq. 4.A.1 in appendix 4.A). The wage cut implies firms to migrate, leading to a new creation of employment. This refers to the assumption by which firm location decision depends exclusively on wages (see Eq. 4.A.4).

On another side, weaker relative wages and higher than average unemployment induce worker net emigration as the opportunity cost of migration decreases.[19]

Blanchard et al. (1992) formalizes the change in the labour force (denoted by $n^*_{it} - n^*_{it-1}$) as a function of unemployment and wages (see Eq. 4.A.3). They interpret this equation like a 'migration equation' as worker mobility better explains differences in average employment growth rate compared to differences in the natural population growth rate. The EU adhesion, in 2004 for most CEECs and in 2007 for Romania has led to East-West migration flows which corroborates the author hypothesis. The correlation between the employment growth rate and the natural growth rate of the population is weak (0,054).

As we are looking for the dynamics in employment, we have first to disentangle to what extent part-time employment and changes in number of hours worked play a role in employment evolution. The variable we use as "employment" is a headcount measure. It does not consider hours worked such that any change in employment is associated with job creation/destruction. We are aware this tend to minimize effective change in employment as part of variation may be attributed to changes in the number of hours worked. Over the 2000-2016 period, we looked at changes in hours-worked from national accounts statistics and compare them with changes in employment.[20] Hours worked, in both groups of countries, do not strictly follow headcount employment. The ratio of hours worked over headcount employment decreased by 2.5 percent in the EU-15 and by 3,5 percent in the CEECs. The drop in this ratio, despite being hard to capture in its impact on the labour market, may be partly analysed through part-time

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[17]Looking at the 25 lowest percentile of women participation rate induce a panel with 47 regions and increase the long-term impact to 80%, reinforcing the results when the women participation rate decreases.

[18]In the second part of Blanchard et al. (1992), the authors introduce relative wages in the model. The lack of data at the NUTS-2 level does not allow us to implement such a specification.

[19]The opportunity cost decreases as the expected income, in the receiving region, increases. The expected income refers to the relative wage times the relative probability of finding a job.

[20]Data are extracted from Eurostat website, from the National account series, available from 2000 to 2016. Due to data availability, France, Lithuania, the Netherlands and Poland are excluded.

employment.

Using LFS-series, on part-time employment, we find a positive but weak correlation with the employment growth rate. Between 2000/2009 and 2010/2017, part-time ratio increased by 3,7pp in EU15 and by 1,6pp in CEECs expect in Lithuania, Latvia, Poland and Romania where it decreases on average by 1,5 pp. We search for a significant relationship, regressing part-time ratio on employment. Employment is found to positively and significantly impact the part-time ratio. An increase of one percent in the employment increases part-time ratio by 0.1 percentage point. Regressing only upon the CEECs, the impact is slightly lowered and become non-significant focusing on the period after 2008. Those elements highlight a relatively weak importance of part-time employment changes in the employment behaviour such that, we ignore this channel.

We are aware, informal employment may also influence the dynamics of the response after an employment shock and could explain more persistent responses in the participation rate. According to ILO (2018), the level of informal employment is twice as high in the CEECs, particularly in Poland and Romania, respectively 38% and 28.9%. Drawing the results without these two countries do not bring any significant change in the participation rate behaviours. The lack on data on this specific topic prevents us from going deeper in this way.

Two main points emerged from our results. The first one concerns the new level of employment after an exogenous labour demand shock, the second lies on the different reactions between the two groups of countries concerning the unemployment and participation rates. When wages increase, following an exogenous positive drift in employment, some firms may reduce their level of employment. This mechanism plus workers immigration minimize the positive impact on employment and partly justifies the return of the unemployment rate to its long-term trajectory. As seen in the previous section, this process needs more time in the CEECs relative to the EU-15.

From the labour supply point of view, migratory flows, following the positive wages' shift and the drop in unemployment, lead the participation rate back to its long-term level. In both group of countries, the observed participation hikes quickly fade out. The labour force behaviours seem to be similar in both group of countries. We corroborate Beyer and Smets (2015) who highlighted an increase in geographical flexibility in West Europe labour supply compared to previous studies (Decressin and Fatás, 1995). Unlike Gacs and Huber (2005) and Fidrmuc (2004), who found no significant inter-regional labour mobility channel, in the CEECs, our results show an increasing role of the labour force migration.

To disentangle the long-term impact on employment we can go through two extreme cases. In the first situation, the initial employment shock is fully permanent. Given that the labour demand depends exclusively on wages, this would state that firms' wage elasticity is null;

the employment creation/destruction process do not occur. The labour supply adjusts only through the unemployment channel i.e. the initial unemployment drop is offset by workers inflows. On the other side, if the employment shock vanishes, given the same assumption as before, this entails a dominant wage channel. In case of a positive shock, the initial wage increase induces a destruction of employment by the same amount of the positive increase; wages return instantaneously to the equilibrium value. Participation and unemployment rates remain unchanged. In between, the speed of adjustment of the labour demand and the labour supply (depending on the wage elasticity) will determine the long-term impact. Given that labour migration depends on unemployment and wages, while firms mobility depends only on wages, we can state that the more the shock is absorbed by unemployment against wages, the higher the long-term impact on employment.

After a fifteen-period projection, the employment level remains at four fifth of the initial shock in the CEECs against three quarters in the EU-15 group. The relatively higher long-term impact in the CEECs tends to highlight a relative stronger unemployment channel. The weaker wage channel indicates that most of the adjustment will be through the labour supply. It also implies weaker firms and labour mobility across regions.

Increasing the labour mobility, following Gacs and Huber (2005), was a key policy, to address the high unemployment issues, found in some left-behind regions, during the first decade of the transition. Indeed, mobility in Germany is found to be a significant vector for reducing regional disparities, particularly on unemployment differential (Niebuhr et al., 2012). Despite we found more significant and robust results than in the past, the wage channel seems to remain relatively low, suggesting a difficult mobility development. This is particularly true in relatively poorer regions (high at-risk of poverty rate) or in more rural regions. The long-term plateau, higher than in other regions reveals a lower adjustment toward wages. A negative exogenous shock on the labour demand, combined with a low wage channel efficiency, lead to a low recovery process with persistent negative long-term impact on employment. Without a specific strategy towards these regions to increase their attractiveness and their resilience, the risk of regional poverty trap without spillovers from economic centres to laggard regions increases.

To increase the wage elasticity, like in regions more turned toward high technology sectors, policy maker should focus on the regional attractiveness (i.e. foreign direct investment) and on the quality of the labour supply. The importance of labour market institution plays a role for the reduction of labour market exclusion (Di Cataldo and Rodríguez-Pose, 2017). In the case of the CEECs, this means investment into regional infrastructure and education (e.g. lifelong learning).

If regional investments into infrastructure represent a leverage for attractive regions, one may

wonder if the degree of budgetary decentralization acts in the same way. To look for this channel, we use two different measures of decentralization (see figures 4.7a & 4.7b on appendix 4.C). The first one considers countries with federal states and the other one look at the share of state/local governments expenditures in total general public government expenditures. Any distinction led to significant differences in the results.

Bande and Karanassou (2014) highlighted the role of capital accumulation to explain regional unemployment variation. This should particularly be the case in regions where the dominant agricultural sector is slowly declining. In Poland and Romania, employment into agriculture represents more than forty percent of total employment in some Nuts-2 regions (respectively 40,7% and 46,7 % in Sud-Vest Oltenia and Nord-Est regions in Romania). Most of this agricultural employment concerns elderly people with very small farms.

To increase their attractiveness, the development of the labour market is, for every CEECs, in the political agenda. For example, in 2011, a sub-group, including Czech Republic, Hungary, Poland and Slovakia integrated the German supply chain (Visegrad group). The Visegrad group is about promoting competitiveness, infrastructure development, employment and trade with Germany as a privileged trading partner.

The approach we used, gives no information about the distinction between intra-country mobility and international migration. This point is particularly challenging, in the case of the EU development. Macroeconomic policies, turned toward labour force mobility, could induce an increase in regional disparities inducing phenomena like 'brain drain' flows at the European level. The way, labour policy is drawn in the CEECs is particularly important, given the higher long-term potential impact.

We found a higher wage elasticity in regions where the women participation rate is relatively higher. This suggest that increasing the women labour market penetration rate leads to a more efficient labour market. We have also found, to a lesser extent, that in case of negative employment shock, the women labour force participation tends to over-react compared to men participation. To increase the women participation and to decrease the vulnerability of this fringe of the population, recent IMF and European countries reports point out the necessity to develop the women penetration rate and to invest in childcare programs. Indeed, on average in the EU-15 group, 30-35% of children, less than 3-yo, are engaged in a childcare program. Concerning the CEECs, this rate on average fall below 15% (e.g. in 2016 the ratio in Bulgaria 12.8%, Czech Republic 4.7%, Hungary 15.6%, Poland 7.8%, Romania 17.4%)[21].

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[21]Eurostat database concerning formal childcare

4.7 Conclusion

During the last years, the CEECs were challenged by their labour markets. Between liberalization, privatization, restructuring and economic development, the CEECs do still represent a particular case of access to market economies as they are part of the European Union. Being an EU member implies an increase in EU-members interdependences. The transition was associated with a huge increase in unemployment and a weak mobility amongst regions (Campos and Coricelli, 2002).

We revisit the seminal approach proposed by Blanchard et al. (1992) to look at the dynamics of the labour market following a simulated shock on employment. The main purpose of this approach is to disentangle the channel driving labour demand shocks on the employment level, the participation rate and the unemployment rate. Thus it is possible to highlight whether an innovation implies adjustment toward wages or unemployment and then to deduce labour demand and supply behaviours.

We draw a comparison between the CEECs and the rest of the EU. We use a reduced model and implement a panel VAR, to track the response of the unemployment and participation rates, following a shock on employment at the regional level, using NUTS-2 regions.

The new plateau reached by employment level represents 75 percent of the initial shock. This tends to highlight a relatively stronger channel toward unemployment instead of wages. The long-term impact is higher than previously found in the literature like Gacs and Huber (2005) on the CEECs or Halleck Vega and Elhorst (2016) on the Western Europe.

The participation rate quickly absorbs the employment innovation, reinforcing the role of labour mobility in both sub-groups. The unemployment rate response is longer in duration particularly in the CEECs group.

We found that poorer regions highlight a weaker wage channel adjustment, reducing their resilience in case of negative employment shock. We also pointed out the potential negative consequences of a weak women penetration rate. The women participation is a double challenge as it has first to be increased to converge to the EU-15 standards, but it also has to be less vulnerable to shocks (reducing the persistence of the shock).

The efficient labour supply channel through labour mobility should be carefully analysed as it may hamper the long-term regional development. If it is associated with a strong increase in regional disparities, then a coherent labour policy should be promoted. The regional development, thanks to regional attractiveness, stimulate the local labour market (e.g. investment into infrastructure). Concomitantly, this is possible, if it is associated with a high skilled labour supply (e.g. high education development) and efficient labour market institution to avoid inefficient and useless workforce outflows. All these last points are coherent with the Europe

2020 growth strategy and with the improvement of the European supply chain.

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Appendices for chapter 4

4.A Blanchard et al. (1992) approach

Blanchard et al. (1992) estimate a constant return production function with infinite long run mobility (labour and firms). Initial amenities induce permanent gap in growth rates. While employment rate may change, mobility allows a stable structure for unemployment and wages differentials. Each region suffers from idiosyncratic shocks, leading to changes into relative wages and unemployment. Thanks to mobility, employment permanently reach a different level. The magnitude of the impact crucially depend on relative speed reaction i.e. how workers and firms react to changes in wages and unemployment. The authors formalizes a labour demand equation. Under full-employment condition:

$$labour\ demand:\ w_{it} = -dn_{it} + z_{it}$$

with w_{it} the relative wage, n_{it} the relative employment, z_{it} the position of the labour demand curve. The indices i and t refer to the regional and temporal dimension. $d > 0$ reflects the negative slope of labour demand. Full employment assumptions allows n to be given at any point of the time such that a change in z provokes a change in wages. Then movements in z are formalized as:

$$z_{it+1} - z_{it} = -aw_{it} + x_{di} + \varepsilon_{it+1}^{d}$$

If $a = 0$, to a given level of wages, the relative labour demand in a specific region may be characterize by a random walk with drift. $a = 0$ is too restrictive, firms localisation also depend on wages; ceteris paribus, relatively weak wages attract firms.
If $a > 0$, the region is attractive for firms such that x_{di} induce a drift in demand for goods and also capture regional amenities. In this case, a is assimilated to the wage short run elasticity. Up to now, it is possible to formalize movements in the labour force, which under the full

employment hypothesis are the same as change in employment:

$$n_{it+1} - n_{it} = bw_{it} + x_{si} + \varepsilon^s_{it+1}$$

where b is a positive parameter. According to the authors, the most part of the difference in employment growth rates between regions is attributable to migration flows (i.e. differences in natural population growth rate are considered to be marginal). This hypothesis is derived from a high correlation between regional employment growth rate and migration flow. Thus it is possible to assimilate the previous equation as characterizing migration where x_{si} represents the regional amenities (under the hypothesis they are time invariant). w_{it} refers to the link between wages and migration. Given these elements, it seems reasonable to interpret the parameter b as the short run elasticity of migration to wages. From these three equations, it is possible to derive the relative wage equation:

$$w_{it+1} = (1 - db - a)w_{it} + (x_{di} - dx_{si}) + (\varepsilon^d_{it+1} - d\varepsilon^s_{it+1})$$

with a count for firms mobility while b is turned toward labour mobility (i.e. migration elasticity). If a specific region attract workers, wages should fall; if the region is more attractive to firms, then wages will increase. We expect relative wages to be different between regions but defined as a stationary process. This point is given by the average relative wage $\bar{w}_i = \frac{1}{a+db}x_{di} - \frac{d}{a+db}x_{si}$. Indeed, the average relative wage does not depend on time. It is also possible to derive the employment growth rate to get:

$$\Delta n_{it+1} = (1 - a - db)\Delta n_{it} + (bx_{di} + ax_{si}) + (b\varepsilon^d_{it+1} + \varepsilon^s_{it+1} - (1 - a)\varepsilon^s_{it})$$

As before, it is possible to derive the trend in employment growth:

$$\bar{\Delta n}_i = \frac{b}{a+db}x_{di} + \frac{a}{a+db}x_{si}$$

Under this perspective, while the relative wages follow a stationary process, an innovation on the labour demand/supply permanently affect the level of employment.

The impact of an innovation on the labour demand is given by :

$$\hat{w}_{it} = -(1 - a - db)^t \to 0$$

$$\hat{n}_{it} = \frac{-b(1 - (1 - a - db)^t)}{(a+db)} \to \frac{-b}{a+db}$$

A negative innovation on labour demand provoke a drop in short run wages. The different mechanisms at stakes allow wages to go back to the equilibrium (worker migration, employment creation/destruction). The employment speed of adjustment is a function of both short-run and long term elasticities (respectively a and b).

When the full wage adjustment assumption, induced by the full employment hypothesis, is relaxed, unemployment starts playing a role.

$$w_{it} = -d(n_{it}^* - u_{it}) + z_{it} \tag{4.A.1}$$

$$c\, w_{it} = -u_{it} \tag{4.A.2}$$

$$n_{it+1}^* - n_{it}^* = b w_{it} - g u_{it} + x_{si} + \varepsilon_{it}^s \tag{4.A.3}$$

$$z_{it+1} - z_{it} = -a w_{it} + x_{di} + \varepsilon_{it}^d \tag{4.A.4}$$

where n_{it}^* is the log of the labour force,[22] u_{it} the unemployment rate defined as the ratio $\frac{unemployment}{employment}$. The log of employment is then $ln(E) = n_{it}^* - u_{it}$. Labour demand (Eq. 4.A.1) highlights a relation between unemployment and wages under a given labour force. Under equation (4.A.2), a higher unemployment rate induces a wage cut. Equation (4.A.3) allow mobility to interact thanks to unemployment and wage (consistent with migration theory (Todaro, 1969)).

Last equation (Eq. 4.A.4) suggests firms location not to be determined by the unemployment rate. A labour demand increase leads to higher wages and a weaker unemployment rate but provoke higher vacancies and longer unemployment durations.

To sum up:

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[22]In the previous specification under full employment hypothesis, n_{it} referred the relative employment

Table 4.4 – Theoretical expected changes following a positive drift in labour

	Impact on:		
	Employment	Wage	Unemployment
Increase in:			
labour demand x_{di}	+	+	-
labour supply x_{si}	+	-	+

In the short run, a negative labour demand innovation increases unemployment and induce wage cuts; in the long term, the effect is opposite thanks to net worker emigration and net inflows of firms. The share of the adjustment attributed to job creation and the share attributed to migration depends on short run elasticities. Given that migration depends on unemployment and wages, while firms mobility depends only on wages, implies the following results: the more the shock is absorbed on unemployment against wages, the higher the long term impact on employment.

4.B   Robustness

(a) Employment - Lags 2   (b) Unemployment rate-Lags 2   (c) Participation rate - Lags 2

(d) Employment - Order   (e) Unemployment rate - Order   (f) Participation rate - Order

(g) Employment - Sub-period   (h) Unemployment rate - Sub-period   (i) Participation rate - Sub-period
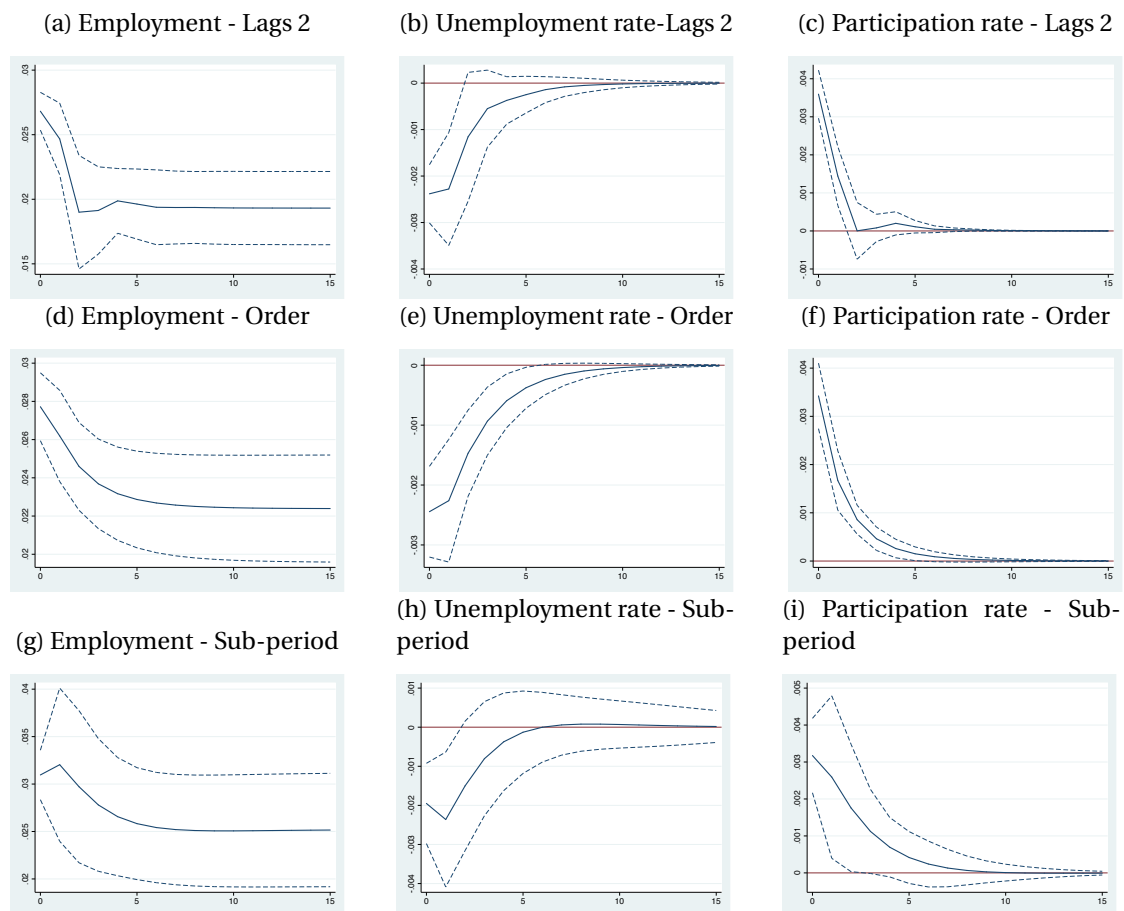
Figure 4.6 – IRFs - Robustness results

Notes: The first set of graphs includes two lags. The second set questions the Cholesky order in the specification.
The last set looks at a sub-panel estimation. We consider only the period from 2010 to 2017 to look at the possible
impact of EU adhesion on the labour market while avoiding the 2008 downturn. Looking at the long term
employment level, in case of EU-15 regions, we found a 43% persistence in the initial shock which provides new
inside of better adjustment through wages. Nevertheless the small time span should be kept in mind.

4.C   Some detailed figures and tests results

Table 4.5 – Main statistics by country in CEECs group

	Number of regions	Working-age population	Employment	Unemployment
BT	3	4475.2	2842.6	366.7
CZ	8	7194.0	4798.3	341.8
HU	7	6718.8	3905.2	320.5
PL	15	25725.2	14832.7	2064.8
RO	8	14428.0	8722.0	673.3
SK	4	3816.4	2280.2	376.9
Total	45	71308.1	43066.1	4877.2

Notes: The three variables are expressed in thousand individuals, on average by country over the 1999-2017 period

Table 4.6 – Main statistics by country in EU-15 group

	Number of regions	Working-age population	Employment	Unemployment
AT	9	5551.0	3867.4	210.1
BE	11	7028.7	4307.1	361.2
DE	32	53880.2	37417.7	2999.4
ES	17	30049.6	17860.5	3496.9
FR	21	40169.6	25406.9	2669.3
IT	18	38758.2	21887.4	2333.2
NL	12	10933.2	8047.6	408.2
PT	4	6926.6	4583.0	479.2
SE	8	5988.2	4413.7	337.7
UK	27	39880.8	28434.3	1802.4
Total	156	293166.1	156225.6	15097.55

Notes: The three variables are expressed in thousand individuals, on average by country over the 1999-2017 period

Table 4.7 – 1st and 2nd Generation Panel Unit Root Tests

CEECs				
Employment growth rate	MW	(with trend)	CIPS	(with trend)
$\chi^2/\bar{Z}_t$	799.7	664.1	-15.59	-12.22
p-value	0.00	0.00	0.00	0.00
Employment rate				
$\chi^2/\bar{Z}_t$	213.1	106.8	-4.070	1.342
p-value	0.00	0.109	0.00	0.910
Participation rate				
$\chi^2/\bar{Z}_t$	366.7	243.2	-8.286	-4.554
p-value	0.00	0.00	0.00	0.00
EU-15				
Employment growth rate	MW	(with trend)	CIPS	(with trend)
$\chi^2/\bar{Z}_t$	2649.3	2229.5	-26.41	-21.93
p-value	0.00	0.00	0.00	0.00
Employment rate				
$\chi^2/\bar{Z}_t$	714.0	430.3	-3.876	2.515
p-value	0.00	0.024	0.00	0.994
Participation rate				
$\chi^2/\bar{Z}_t$	1329.7	875.1	-13.00	-5.624
p-value	0.00	0.00	0.00	0.00

Notes: Null for MW and CIPS tests: series is I(1). Maddala-Wu (MW) test assumes cross-section independence. CIPS (Im pesaran Shin) test assumes cross-section dependence is in form of a single unobserved common factor. The tests are implemented with and without trend. χ^2 refers to Mandala-Wu test while $\bar{Z}_t$ corresponds to CIPS test.

4.D Variables definition

Working-age population: Extracted from Eurostat [lfst_r_lfsd2pop], the working age population, by NUTS-2 region, summarized in the labour force survey, defines the population aged 15 to 64 years old, in thousands individuals and is available by gender distinction.

(a) Political decentralization

(b) Public spending decentralization
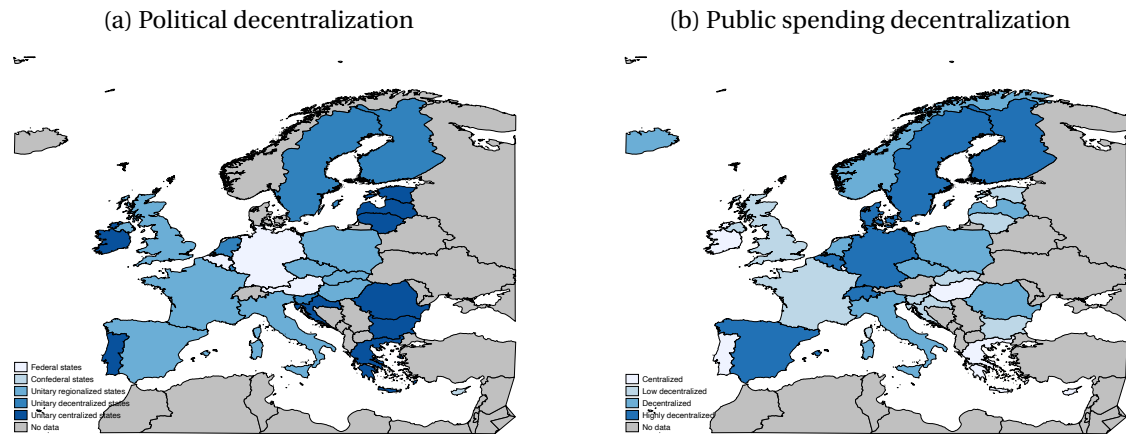
Source: Magone, J. M. (2013). Contemporary european politics: A comparative introduction. Routledge. page(310);

Source: Eurostat General government expenditure by sector, code [gov_10a_exp]; author calculation, on average from 2012 to last data available;

Figure 4.7 – Political and budgetary decentralization

Employment: Extracted from Labour Force Survey on Eurostat, [lfst_r_lfe2emp], employment, over the 15-64 y-o population, consider the following categories (extrat from EU-LFS concept of labour force status): persons who during the reference week worked for at least one hour for pay or profit or family gain; persons who were not at work during the reference week but had a job or business from which they were temporarily absent.

Unemployment: Extracted from Labour Force Survey on Eurostat, [lfst_r_lfe2emp], unemployment, over the 15-64 y-o population, refers to the ILO unemployment standards, i.e., consider persons not employed, currently available for work and actively seeking work.
More on EU labour force survey methodology: https://ec.europa.eu/eurostat/statistics-explained/index.php

4.E   Results from panel-VAR estimation

Table 4.8 – Results

	EU-15	CEECs	Low women participation	High women participation	High poverty	Low poverty
Employment						
L1.Emp.	0.011	0.044	0.023	0.029	0.078**	0.029
	(0.029)	(0.052)	(0.050)	(0.029)	(0.034)	(0.055)
L1.Unemp.	-0.084**	-0.163**	-0.110**	-0.102**	-0.048	-0.054
	(0.039)	(0.070)	(0.051)	(0.045)	(0.055)	(0.044)
L1.Part.	-0.454***	-0.479***	-0.393***	-0.520***	-0.433***	-0.229***
	(0.048)	(0.086)	(0.073)	(0.047)	(0.054)	(0.070)
Unemployment						
L1.Emp.	0.006	0.023	0.012	0.015	0.039*	0.001
	(0.013)	(0.018)	(0.019)	(0.012)	(0.021)	(0.032)
L1.Unemp.	0.648***	0.637***	0.722***	0.585***	0.558***	0.788***
	(0.036)	(0.045)	(0.055)	(0.024)	(0.046)	(0.063)
L1.Part.	-0.011	0.028	-0.004	0.012	0.031	0.042
	(0.035)	(0.036)	(0.057)	(0.021)	(0.033)	(0.074)
Participation						
L1.Emp.	0.030**	0.003	0.012	0.024	0.013	0.024
	(0.015)	(0.019)	(0.019)	(0.015)	(0.026)	(0.039)
L1.Unemp.	0.013	0.095**	-0.004	0.084***	0.197***	-0.005
	(0.030)	(0.038)	(0.043)	(0.024)	(0.042)	(0.049)
L1.Part.	0.315***	0.416***	0.449***	0.270***	0.395***	0.452***
	(0.031)	(0.048)	(0.047)	(0.028)	(0.038)	(0.057)
Nb observations	2544.00	688.00	752.00	2480.00	912.00	528.00
Nb groups	159.00	43.00	47.00	155.00	57.00	33.00
Converged	1.00	1.00	1.00	1.00	1.00	1.00
Eigenval. Emp.	0.07	0.05	0.04	0.10	0.08	0.04
Eigenval. Unemp.	0.26	0.41	0.44	0.21	0.41	0.44
Eigenval. Part.	0.65	0.63	0.72	0.58	0.55	0.79

Standard errors in parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
Notes: This table presents results from panel system-VAR estimation over the different subgroups of regions presented in chapter 4. Eigenvalue below one suggests that the estimation satisfies the stability condition.

5 Education, public expenditure and economic growth

5.1 Introduction

In the context of the EU-2020 strategy, smart growth objectives include an increase in the share of the population aged 30-34 with tertiary education to at least 40 percent. Such a target has been defined to meet the increasing demand, for a more skilled labour force. In 2019, the objective has been reached (40.7% on average) but with some international disparities. Looking at the CEECs, four countries, namely Bulgaria, Croatia, Hungary and Romania do not attain their target while others, like Baltic states or even Poland are part of the best performers.[1]
Investment in tertiary education is correlated to the role of human capital in economic growth. According to EC (2018), the impact of a better educated labour force, on long-term economic growth, sharply depends on an efficient labour demand-supply matching process.
In the EU convergence context, one may wonder, whether such a target was useful to both increase the level of human capital and to generate smarter economic growth. In the growth literature theory and more specifically looking at the role of the government, we try to put some new insights, to understand the impact of increasing the human capital, on economic growth. The main purpose of this paper is to clarify the interactions, between economic development and public spending on education, under the assumption that to increase human capital, education funding may be determinant.
Our paper contributes to the literature, from an empirical perspective. Using the endogenous growth literature, we update Blankenau and Simpson (2004); Blankenau et al. (2007) to dig deeper on the contemporaneous relationship, between public spending and human capital formation. The literature highlights the problem of the human capital measure (Krueger and

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[1]Source: Eurostat, Tertiary educational attainment by sex, age group 30-34, code [t2020_4]

Lindahl, 2001). We choose a recent work from Lim et al. (2018) who computed a multidimensional index, taking into account, education and health to transcript the human capital evolution.

Finally, by introducing an efficiency measure, using data envelopment analysis, à la Ji and Lee (2010), we complete recent research from Neycheva (2010, 2019) on public education expenditure and human capital quality. Our efficiency measure captures the public spending's ability, to generate human capital, such that we are able to explain the lack of significant impact, from public spending on education to GDP.

We estimate our growth equation, using a LSDV estimator, over a sample of 84 countries belonging to upper-middle and high-income economies. We revisit the equation from Blankenau et al. (2007), with World Development Indicators from the World Bank, over the last thirty years, with five years period average data. We consider public spending and their inherent fiscal counterparts, plus a proxy for the human capital level.

We first find an overall positive and significant impact of education expenditure on economic growth. This result holds when introducing the fiscal counterweight as developed by Blankenau et al. (2007). However, looking at upper-middle income countries, the results are more mitigated, even when we omit the 1990's, as most of countries in upper-middle income are transition countries, by that time.

The introduction of efficiency, into the model, restore the positive and significant relationship between public spending and GDP only in countries with a relatively high efficiency level. Our results support the idea that increasing public spending on education, per se, is not sufficient to generate the human capital, inherent to the GDP increase. A coherent education policy should come with public spending, to avoid any disconnection between human capital and budgetary policy.

Section 5.2 of the paper presents the related literature. In section 5.3 and 5.4 we present the empirical approach, the data and our first results. Section 5.5 develop the role of efficiency in public spending on education and section 5.6 concludes.

5.2 Literature review

Since the seminal contributions from Lucas (1988) or Mankiw et al. (1992), the literature agrees on the role of human capital as a production factor, to generate economic growth. A better educated labour force is expected to foster innovation (Nelson and Phelps, 1966; Benhabib and Spiegel, 1994). Benhabib and Spiegel (2005) highlight the double role of education, increasing human capital, as an inherent component of innovation but also increasing knowledge flows

among economies. With an original dataset from UNESCO Valero and Van Reenen (2019) confirms the spillovers effect through innovation associated with the higher supply of human capital.

However, the way human capital is measured represents a tricky challenge in the literature. Neglecting the usual school enrolment, Zhang and Zhuang (2011) or Neycheva (2019) prefer the use of tertiary education[2] as a reference to measure human capital.

To get rid of such unidimensional measure of human capital, Barro and Lee (2013), on a panel of 146 countries from 1950 to 2010, use disaggregated census data to improve the way the human capital stock is captured. They have built a new updated dataset on educational attainment and years of schooling,

A recent paper from Lim et al. (2018), goes further and proposes a more comprehensive human capital index. They try to empirically reconcile the human capital concept to the empirical data availability, using life expectancy, educational attainment, quality in education and health. Their index covers the 1990-2016 period for 195 countries and confirms that human capital is a broader concept that can't be solely measured thanks to the education level.

Whatever the human capital measure is, another large strand of the literature focus on the education funding issue (Cashin, 1995; Kneller et al., 1999) and on its composition (Acemoglu et al., 2006; Zhang and Zhuang, 2011; Agénor and Canuto, 2015).

Financing education, particularly through public spending may dampen the long run economic impact of increasing human capital (Glomm and Ravikumar, 1992; Kaganovich and Zilcha, 1999; Dissou et al., 2016). According to Annabi (2017) a negative impact of public spending is found on the generation supporting the higher share of the policy shock.

Blankenau et al. (2007) reconcile theory of endogenous growth and the link between education expenditure and economic growth with empirical data. They use the overlapping generation model from Glomm and Ravikumar (1997) and Blankenau and Simpson (2004) with adjustments through taxation to highlight the positive interactions between education and growth, at least in high income countries.

Bose et al. (2007) and Afonso and Jalles (2014), considering the state budget constraint and the fiscal composition, find that education spending is significantly associated with growth. Gemmell et al. (2016), looking at OECD countries, examine the long-run GDP impacts of changes in the shares of different government spending categories and converge to the idea that investment into infrastructure and education boost the GDP.

According to Gamlath and Lahiri (2018), the role of substitution between public and private spending is one of the determinants of the overall education funding economic impact. Such

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[2]Tertiary education is measured as the ratio of the population with at least a tertiary educational attainment over the total population in the same age group.

imperfect substitution effect evokes the interactions, that exist between primary-secondary public education funding and tertiary education Arcalean and Schiopu (2010).

Aghion et al. (2009) highlight the importance of the composition (primary, secondary, tertiary) of education spending to explain different growth path. Vandenbussche et al. (2006) and Ang et al. (2011) test the imitation/innovation assumption and find that tertiary education investments fit better in countries closed to the technological frontier while primary and secondary education reinforce the imitation stage.

5.3 Empirical approach

5.3.1 Testable equation

From the model of Blankenau et al. (2007), described in the appendix, we estimate the following empirical specification:

$$y_{nt} = \beta_0 y_{nt-1} + \beta_1 e_{nt} + \beta_2 p_{n,t} + \beta_3 \tau_{n,t} + \beta_4 b_{n,t} + \beta_5 h_{n,t} + \eta_n + \delta_t + \mu_{n,t} \quad (5.3.1)$$

The left-hand side variable refers to the GDP per capita as five years period averages. In the right-hand side, we consider the GDP lagged one period, then add some other interest variables to complete the specification.

The interest variable, e, corresponds to the government expenditure on education (PSE), which is our main interest variable. To avoid any misinterpretation in the PSE coefficient, we control for global government expenditure, p, measured as the government final total expenditure, excluding education expenditure. The introduction of total government expenditure isolates the education expenditure impact on economic development. Moreover, it considers the possible implicit increase in overall expenditures following an increase in education expenditure. According to Blankenau and Simpson (2004), countries tend to have higher level of non-education per capita expenditure when they face larger per capita education spending. As another control variable, we introduce the stock of human capital measured by h.

As suggested by the literature, the introduction, into the model, of the government expenditure, implies to look at the way they are financed. Indeed, the way public education expenditures are financed may have a direct impact on growth. While we expect public spending to positively affect economic growth, required taxes to finance such expenditures, may act as a counter-weight, such that the overall impact is mitigated, at least ambiguous (Blankenau and Simpson, 2004). The fiscal part of this equation considers both fiscal revenue (denoted by τ) and the

government budget surplus (denoted by *b*). This last variable controls the fiscal credibility. A country (η) and a time (δ) fixed effects allow individual and temporal heterogeneity. An error term (μ), following the usual characteristics close our empirical approach.

5.3.2 Data and descriptive statistics

Like in Blankenau et al. (2007), we use World Development Indicators (WDI) from the World Bank database.[3] We focus on the 1990-2018 period. Despite being interested by the European context, our empirical approach, for evident reason of getting more robust results, handles with a worldwide sample.

To reduce the panel heterogeneity bias, we restrict our panel to upper-middle income and high-income countries as defined by the World Bank. This last point gives some credibility as the theoretical model is built upon a deviation from the steady state which is a strong assumption in case of lower income countries. The exact list of countries considered in our sample is available in appendix 5.C.

The table 5.1 presents the main statistics of our variables. As expected, the real GDP per capita is higher in high-income countries (on average 26512\$ a year against almost 5000\$ in upper-middle income group). However, if we focus on the period from 2000 to 2018, the real GDP per capita growth rate is relatively higher in the last group (respectively 2.7% and 1.52% per year) which supports the convergence process that postulates higher GDP growth rate in relatively poorer countries.

The government expenditure considers the general final consumption government expenditures by function. For the purpose of this study, we mostly focus on total expenditure and education expenditure. We only look at general government statistics. First the level of decentralization is heterogeneous among countries and looking at a sub-sector like central or local government may capture political organization heterogeneity more than fiscal policy choices. Second, multiple breaks in time series were observed during the period, mainly due to reclassification or reorganisation.[4]

On the overall period, government final consumption (excluding education) is 4pp. higher in high-income countries. Even during the end of the period, the ratio of public expenditure to GDP did not change and remain relatively constant. The same is found looking precisely on education expenditure which respectively counts for 4.17% and 4.87% of GDP in upper-middle- and high-income countries. However, the share of education expenditure in government total

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[3]The exact definition of the variables is available in appendix 5.D, using World Bank definition.

[4]It is the case for example in Europe, in Estonia in 2004-2005 at the local government sector level; in Hungary in 2012 for a specific reorganisation in the fields of education and health between the central and local government or in Romania in 2011 for the social contributions.

Table 5.1 – Descriptive statistics

	Mean	Std. Dev.	Min	Max	Countries	Periods
Upper-Middle Income Countries						
GDP	4968	3108	132.3	20512	47	44.7
Gov. Cons. X	10.65	4.19	1.82	29.97	39	18.8
Gov. Cons. Educ	4.17	1.68	0	14.05	43	18.1
Taxation	5.29	4.36	-1.38	41.11	34	25
Gov. Budget	-2.01	4.06	-18.4	21.79	37	24.5
Human Capital	11.9	4.02	3.56	23.18	46	26.3
High Income Countries						
GDP	26512	16504	2139	92077	49	46
Gov. Cons. X	14.02	4.38	2.06	36.14	48	26.9
Gov. Cons. Educ	4.87	1.35	1.04	8.55	49	26.9
Taxation	7.93	3.78	0.23	29.95	41	34
Gov. Budget	-1.71	4.93	-32.04	26.36	44	34.3
Human Capital	19.57	4.52	6.09	28.4	48	26.3

The table presents each variable by sub-group of countries. The average number of periods corresponds to the number of available periods on average in each country. GDP represents the real per capita GDP in constant $ in 2010; Government consumption, tax revenue and budget variables are expressed in percent of GDP. The human capital is the index from Lim et al. (2018), it considers both education and health in its construction.

expenditure is two pp. higher in upper-middle income countries, suggesting a stronger public strategy toward education in this group.

Following Blankenau et al. (2007), taxation (τ) controls for the importance of the crowding out effect of financing government expenditure, implicitly through non-distortionary taxation. The measure follows Eq. 5.A.14 in appendix 5.A

$$\tau_i = \frac{g + e + b}{1 + \phi}$$

where $\phi = \frac{\tau_c \tilde{C}_t}{\tau_i Y_t}$.

To construct this variable, we refer to ($e + g$) as total general government expenditure and b as the budget surplus. Last, the ϕ component is calculated as in Blankenau et al. (2007) using world bank dataset on taxation where $\tau_c \bar{C}_t$ is the taxes on goods and services and $\tau_i Y_t$ taxes on income profits and capital gains.

Taxes on income, in GDP terms, is relatively lower in upper-middle economies (respectively 3.87% and 5.73%). The gap, between the two groups of countries, seems to have slightly decreased over the years. However, the share of income taxation among total government revenue has remained constant, around 22.96% and 27.34% respectively in upper-middle- and high-income countries. The constant share respect assumption stated in the model from Blankenau et al. (2007).

The budget surplus variable equals government revenue minus expense, minus net investment in non-financial assets, in GDP percentage, and appears in the literature to be a significant determinant of economic growth as it captures the international lending position. On average, the budget surplus is negative in both groups and is relatively similar, closed to -2% of GDP.

Our last variable concerns the measure of the stock of human capital. The school enrolment suffers from a high level of inertia, as it comes closed to a stable level. This is particularly true in high-income countries. The more recent literature focus on the educational attainment (Barro, 2001; Faggian and McCann, 2019; Neycheva, 2019) or on years of schooling à la Barro and Lee (2013).

In upper-middle income countries, from 2010 to last data available, tertiary educational attainment represents on average 20% of the population while this ratio hikes to 33% in high-income countries. According to Barro and Lee (2013), in 2010, years of schooling, in upper-middle economies remain below high-income (respectively 8.5 and 10.7 years); completed tertiary education is half lower in the first group while the rate of the population with no education is twice bigger.

These variables implicitly consider a homogeneous level of education quality among countries. Such an assumption has been partly tackled by Hanushek and Woessmann (2020) with an

increasing gap between *education quality* and *education quantity*.

Following Hanushek and Kimko (2000), human capital in the growth equation should be apprehended through the prism of cognitive skills.[5] The role of education quality has been largely studied to trace a more realistic role of human capital upon economic growth (Barro, 2001). The impact of cognitive skills is an important driver to understand the role of education on economic development (Hanushek and Woessmann, 2008). Using PISA-scores tests from OECD, Hanushek and Woessmann (2010) highlight the positive growth impact of improving the labour force skills. Despite an increasing number of countries attending to the PISA tests every three years, using PISA-scores will drastically decrease the dimension of our panel.

We refer to a recent work from Lim et al. (2018), using both education and health to apprehend the human capital level. They construct a yearly index for 195 countries from 1990 to 2016 using census, health, learning and household surveys from multiple sources. This globalizing approach get rid of many issues concerning the human capital measures. In our panel of countries, the index belongs to the [3;29] interval. The lowest values are observed in upper-middle income economies such as Equatorial Guinea, Namibia and Botswana. Finland, Iceland, Denmark and Netherlands are the better graded.

5.3.3   Empirical issues

All variables in the model are expressed in log-terms except for the budget surplus. As we want to disentangle the long-term relationship between government expenditure and economic growth, we transform our variables to obtain five years average period. Doing so, we omit small-term variation in the data that would introduce noises in our specification.

Since the seminal paper from Nickell (1981) who described the inconsistency of the OLS estimator under dynamic panel data with individual fixed effects, the literature provides a bias correction using least square dummy variables (LSDV) estimator (Kiviet, 1995; Bun and Kiviet, 2003). More recent works from Bruno (2005a,b) allow to estimate such autoregressive models, with N (moderately) large and finite T, using a bias corrected LSDV estimator, even in the presence of unbalanced panel, which is our case. Such an approach also provides a bootstrap variance covariance matrix. We impose the initial estimates to follow the Blundell-Bond estimator. Our results are robust to other initial approach like Anderson-Hsiao (first different with variables lagged twice - see column 1 in table 5.5).

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[5]The literature refers to tests scores such as the PISA OECD tests to measure such cognitive skills.

5.4 Results

Table 5.2 – Main results

	(1) Main	(2) Fiscality	(3) Human capital	(4) Upper- middle income	(5) Post-2000
L.GDP per capita	0.666***	0.650***	0.704***	0.731***	0.662***
	(0.037)	(0.033)	(0.049)	(0.083)	(0.068)
Other Pub. Spend.	0.079***	0.081***	0.068**	0.053	0.113*
	(0.027)	(0.030)	(0.034)	(0.048)	(0.060)
Pub. Spend. Educ	0.099***	0.099***	0.112***	0.005	0.047
	(0.027)	(0.037)	(0.042)	(0.039)	(0.070)
Taxes		0.035	0.047*	0.087**	0.108***
		(0.031)	(0.028)	(0.034)	(0.041)
Gov. budget		0.013***	0.017***	0.011*	0.008
		(0.003)	(0.004)	(0.006)	(0.006)
Human capital			-0.013	-0.153	0.068
			(0.129)	(0.157)	(0.215)
Nb observations	532.00	378.00	293.00	149.00	115.00
Nb groups	84.00	65.00	65.00	35.00	35.00

Notes: Standard errors in parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
Dependent variable for all regressions is the five-years average of annual per capita GDP (in log terms); We use an LSDVC estimator; Standard errors are obtained thanks to a bootstrap variance-covariance matrix using 50 repetitions. Regression 1-3 considers the overall group of countries, addind taxation and human capital stock respectively in column 2 & 3. Column 4-5 focus on upper-middle income groups.

In table 5.2, we present the results following the Blankenau et al. (2007) model. In every specification, the dependant variable is the real GDP per capita. In the first column, we only introduce the lag of GDP, other government expenditures and public spending on education. Then in column two and three, we respectively add our measure of taxation and the stock of human capital. In these three first estimations, we run our model over the all sample of countries. As expected, the lagged dependant variable has a positive and highly significant co-efficient, below unity which summarises the convergence hypothesis of the growth equation. As suggested by our economic model, public expenditures positively impact GDP as does spending on education. In the third column, considering the overall set of variables on gov-

ernment expenditure, fiscal counterpart and human capital, an increase of one percent in PSE leads to a 0.11% increase in GDP per capita. Our coefficient attached to public spending on education is slightly lower than what we found in the literature. In Blankenau et al. (2007) the impact from PSE to GDP was at 0.2% while Neycheva (2010) found a 0.3 coefficient in the CEECs.

The taxation variable highlights a positive (and even significant) sign. This counter-intuitive positive sign remains when we only look at income taxation revenues or more global government revenue. However, our discussion about expenditure efficiency will get rid of this issue. Furthermore, other fiscal variables like the government budget surplus, as expected do have a positive and significant impact on GDP. This last point comes closed to Blankenau et al. (2007).

In the two last columns, we put the focus on upper middle-income countries. However, to understand to what extend public spending on education may have played a role in their economic development, we refer here to upper-middle-income economies as defined in 1995. Our new panel of countries counts 35 economies. In this subgroup of countries, the positive impact of public spending is not significant. As most of the countries in this groups are classified as *transition economies* during the nineties, we also provide the results for the sub-period after 2000 to tackle the first stages of transition. Despite public spending recovers the positive and significant impact, PSE do not.

In any three specifications with the stock of human capital (column three to five), the attributed coefficient is significant. Looking at other measures of human capital don't improve the model.[6] The absence of positive and significant impact of education spending on GDP catches our attention, in case of upper-middle-income countries.

Before going further, we consider a GMM alternative estimator to test for the robustness of our approach. Despite it has been proven that LSDV estimators are more efficient than GMM in case of relatively small N dimension, GMM is a good alternative to tackle the endogeneity bias usually found in growth equation model. The GMM estimator, à la Blundell and Bond (1998) considers each variable as potentially endogenous while the LSDVC from Bruno (2005b) considers instruments as exogenous.

In column 1 of table 5.5, in appendix 5.B, we implement a system GMM estimator using previous work from Roodman (2009). Results of the GMM estimator are in line with our main set of regressions. We both find positive and significant impact from public spending and PSE on GDP; as well as for the government budget surplus. Neither taxation nor human capital stock appear to be significant.

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[6]As a robustness, we replace Lim et al. (2018) index by commonly used variables i.e., primary school enrolment à la Blankenau et al. (2007), educational attainment à la Neycheva (2019) or years of schooling à la Barro and Lee (2013); we never get a significant impact of the stock of human capital on GDP.

5.5 Efficiency of public education expenditure

From equation 5.A.1 in section 5.A , the agent is endowed with public education and the human capital of the previous generation to explain human capital accumulation. The absence of significant impact from PSE in upper-middle income economies, after considering the taxation counterweight, suggests that the problem may lie on the human capital formation. Increasing education expenditure, to the expense of less productive expenditures improves school attainment (Gupta et al., 2002). However, our primary results highlight a disconnection between increasing the stock of educated population and the underlying concept of human capital, even when we control for education quality with the human capital index from Lim et al. (2018).

Lu (2018) and Gamlath and Lahiri (2018) detail the importance of public schooling quality. These two studies suggest that if the share of unproductive education is too high, then private schooling may increase. This asset high-jacking hampers more productive private investment (e.g., toward tertiary education). An incoherent education investment policy will not stimulate "knowledge network externalities" (Agénor and Canuto, 2015), leading to a low-growth trap issue, characterized by a misallocation of talents. This relatively high level of over(under)education mismatch has consequences on wages and on the labour market in general (Leuven and Oosterbeek, 2011). Using an extension of the Mankiw et al. (1992) model of growth, in the CEECs, Neycheva (2019) put the light on the need of having a better educated population only if the fulfilled occupations are in line with the qualification (i.e., no vertical mismatch).

From figures 5.1a and 5.1b, no clear pattern emerges in the relationship that may exist between increasing PSE or educational attainment with PISA results (this is particularly true in the case of upper-middle economies). The idea of possible inefficient PSE is illustrated by triangles on figure 5.1a with a high variability in both PSE and PISA values.

Back to Eq. 5.A.6, we could think about an efficient investment toward human capital such that a share of $\tilde{e}Y$ is actually transferred into g i.e., non-productive expenditures. Up to now, $\tilde{e}Y$ refers to *efficient* education expenditure.

To capture this *efficiency* in public education expenditure, we use Data Envelopment Analysis (DEA) technique from Ji and Lee (2010), to generate a new variable, we use as a weight on PSE. The DEA process, by comparison with the best producer, measures the efficiency of the decision-making unit (DMU). We focus on the input-oriented model, to minimize our input
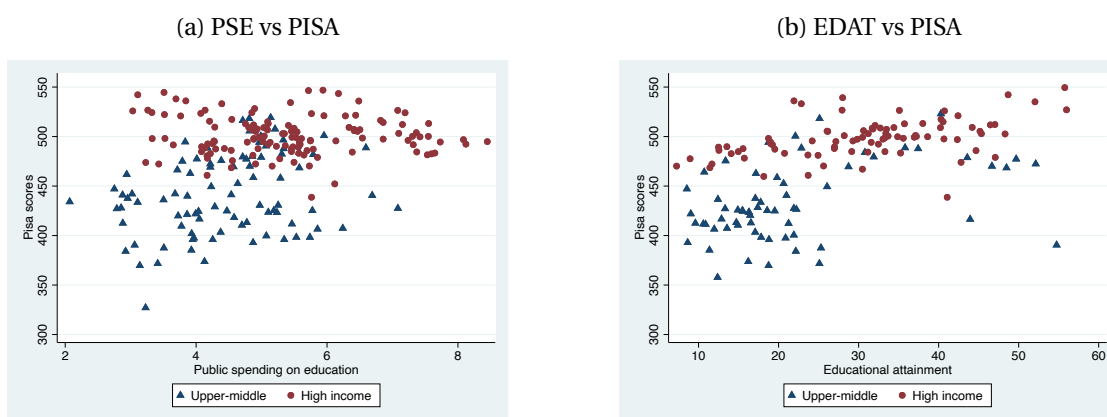
(a) PSE vs PISA (b) EDAT vs PISA

Figure 5.1 – Pisa scores and education

Notes: The left-hand side figure presents public spending on education versus PISA-scores by income countries level. The right-hand side switches PSE to tertiary educational attainment (population aged 25 and over with at least upper secondary education).

with a given output level. This makes sense if we consider that the government strategy is to reach a certain level of human capital and wish to minimize public spending to attain this goal.[7] We use the public spending on education and health as the input and the measure from Lim et al. (2018) for the output.[8]

To allow for the best estimation of PSE efficiency, we run our DEA process on the overall

Table 5.3 – Efficiency statistics

	Mean	Std. Dev.	Min	Max	Countries	Periods
Upper-middle income	0.43	0.12	0.15	0.81	41	13.4
High income	0.70	0.14	0.21	1	48	17.8

sample of countries belonging to lower-middle, upper-middle- and high-income countries. We also had the possibility to run our DEA on each sub-group by revenue level. However, this strategy seems to be less interesting. The underlying idea, with the sub-groups approach, states that the real GDP per capita strongly influences the ability of the government to generate higher efficiency expenditure, while our intuition lies on the idea that we may find efficient

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[7]Another strategy would be to get the maximal human capital level, with public spending as given. This is the output-oriented strategy. As described in the introduction, in the EU context, the EU-2020 strategy determines human capital target such that we consider the input-oriented model. We tried the output-oriented model and results remain in the same vein.

[8]We introduce health expenditure as an additional input because the Expected Human Capital index fromLim et al. (2018) is constructed on health and education.

government spending with a relatively lower GDP per capita.[9]

We obtain a new variable, named efficiency, which order every country-year observation. Statistical details of this new variable are available on table 5.3. We introduce this new variable as an interactive with PSE in the growth regression. Doing so, we condition the overall impact of educational expenditure, to its efficiency level. Results are detailed in table 5.4.

In column 1 and 2 of table 5.4, we consider respectively the overall group of countries and upper-middle income group, to compare whether our results change given the introduction of the efficiency variable. Our results are coherent with our first set of estimations (column 3 & 4 of table 5.2). However, the coefficient attached to the interactive variable is not significant in any two regressions, such that we cannot state that the inclusion of efficiency improves the prediction of PSE impact on growth.

We wonder to know whether the efficiency level matters. Using the real GDP per capita to construct different sub-groups seems to be useless. We split our sample of countries in two new sub-groups. Countries with a public expenditure efficiency level, in 2010, below the median, are considered as inefficient countries; efficient otherwise.

Column 3 and 4 of table 5.4 present the results from respectively not efficient and efficient groups. While in the inefficient group, any coefficient, attached to the public spending, is significant; in the efficient group, public spending is positive and significant at a 1% level. Moreover, the marginal effect strongly increased compared to previous estimation suggesting an important role of efficiency in public spending to understand their role on GDP. An increase of 1% in public spending on education, increase the real GDP per capita by 0.2% (twice as high as in the main regression). This new result is coherent with the literature (Blankenau et al., 2007).

We look in deeper details, the difference between groups based on their income and based on the efficiency. We observe that countries, belonging to the upper-middle income group but are in the efficient group, are mostly Central and Eastern European countries.[10] Despite the low number of countries, we implement a last estimation (column 5 of table 5.4) and found robust results. Moreover, when dealing with countries by efficient level, we observe that the positive sign attached to the taxation disappears, becoming both negative and significant in line with economic theory.

Our efficiency strategy is robust to change in the first stage estimator (column 2 of table 5.5, replacing the Blundell-Bond by the Anderson-Hsiao estimator or to other human capital measure (column 3 of table 5.5 using the Barro and Lee (2013) years of schooling index). We expect

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[9]Hungary, Poland and Slovakia are found to be efficient in the overall group but not their respective income group

[10]This concerns Czech Republic, Estonia, Croatia, Hungary, Lithuania, Latvia, Poland, Serbia, Slovakia and Slovenia

Table 5.4 – Efficient expenditure

	(1) Efficiency	(2) Upper-middle income	(3) Not efficient	(4) Efficient	(5) EU-13
L.GDP per capita	0.710***	0.743***	0.733***	0.534***	0.493***
	(0.054)	(0.070)	(0.096)	(0.054)	(0.128)
Other Pub. Spend.	0.087*	0.083	0.074	0.301***	0.601***
	(0.044)	(0.054)	(0.079)	(0.092)	(0.139)
Pub. Spend. Educ	0.165***	0.015	0.058	0.212***	0.211***
	(0.061)	(0.101)	(0.075)	(0.075)	(0.061)
Efficiency	0.568	-0.220			
	(0.619)	(0.866)			
PSE X Eff.	-0.131	-0.030			
	(0.087)	(0.143)			
Taxes	0.026	0.077*	0.034	-0.092*	-0.158**
	(0.029)	(0.040)	(0.070)	(0.052)	(0.079)
Gov. budget	0.022***	0.014**	0.031***	0.017***	0.030***
	(0.003)	(0.006)	(0.010)	(0.004)	(0.010)
Human capital			-0.066	0.402	-1.017
			(0.167)	(0.266)	(0.837)
Nb observations	286.00	148.00	121.00	157.00	37.00
Nb groups	65.00	35.00	31.00	33.00	9.00

Notes: Standard errors in parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
Dependent variable for all regressions is the five-years average of annual per capita GDP (in log terms); We use an LSDVC estimator. Standard errors are obtained thanks to a bootstrap variance-covariance matrix using 50 repetitions. Regression 1 considers the overall group of countries while regression 2 focus on upper-middle income. Regressions 3-5 distinguish countries by efficiency level. The first two regressions present an interaction term between efficiency and public spending on education.

education expenditure to have a significant impact on long-term growth. To control whether our model remains robust, we last change the data frequency, using ten years average period variable (column 4 of table 5.5. The coefficient of PSE is significant and slightly increased up to 0.247. The coefficient of taxation is negative and highly significant.

5.6 Conclusion

Given the EU-2020 strategy, on increasing the educational attainment, we question the role of public spending on education to generate economic growth. Revisiting the Blankenau et al. (2007) model, we draw an empirical estimation of the interactions between human capital and economic growth. We use the WDI of the World Bank for 84 countries over the last thirty years. We mostly focus on upper-middle- and high-income countries.

Our equation controls for other public spending and the way they are financed thanks to the fiscal measure à la Blankenau et al. (2007). To proxy the human capital stock, we introduce the index from Lim et al. (2018), using a multidimensional approach based on education and health.

We find positive impacts from public spending on education and other public spending on GDP. However, when we focus on upper-middle income countries, the relationship becomes not significant. A recent paper from Neycheva (2019) explained the lack of significant results between education expenditure and economic growth thanks to labour mismatching, underlying the role of human capital quality, in Eastern Europe.

To disentangle this unsignificant outcome and restore the impact of human capital quality, we estimate an efficiency measure, of public expenditure, to generate human capital, using a data envelopment analysis process.

The introduction, as an interactive variable, of efficiency, into the growth equation do not give more conclusive results, unless we consider countries, with a relatively higher level of efficiency. In this case, the marginal impact of PSE on GDP, depending on the average efficiency, increases (twice as high). Last, we provide a specific analysis to countries in the upper-middle income group with a high level of efficiency and found an even stronger marginal impact.

We review the role of human capital on economic growth and more importantly, the importance of implementing an efficient education strategy to minimize inefficient public education expenditure. By introducing the concept of efficient expenditure, we allow PSE to positively impact economic development and to a lesser extend to confirm the important role of public spending in generating human capital.

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Appendices for chapter 5

5.A   Model of growth: Blankenau et al. (2007)

The agent's problem

The model consists of a simple overlapping generations model of growth, derived from models of Glomm and Ravikumar (1997) and Blankenau and Simpson (2004). Homogeneous agents live three periods and a single good is produced by a representative firm. A government and the technology parameters allow to produce human capital.

Normalized to one, a continuum of agents born each period and refers to the 'learners'. The 'learners' receive an endowment of public education inputs which is combined with the prior generation human capital to form the level of human capital in the next period such that, like in Glomm and Ravikumar (1997):

$$h_{t+1} = \xi E_t^\mu h_t^{1-\mu}; \mu \in [0,1], \xi > 0 \tag{5.A.1}$$

where μ captures both government expenditure on education and the human capital level of the prior generation relative importance in generating actual human capital. Following Blankenau and Simpson (2004), public and private education expenditures are imperfect substitutes as government expenditures are usually more focus on primary and secondary education while private investment in human capital are more turned toward tertiary education.[11]

In $t+1$, the agent becomes an 'earner' as she supplies her labour endowment to receive after-tax income, in line with her human capital stock.

$$w_{t+1} h_{t+1} (1 - \tau_i)$$

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[11] Blankenau and Simpson (2004) keep the Cobb Douglas specification despite elasticity of substitution between private and public inputs in tertiary education are found to be relatively higher (Houtenville and Conway, 2008).

where w is the corresponding wage and τ_i is the income tax rate. The net wage income is used to consume and save for old age. Through capital accumulation, at the end of period $t + 1$, the agent is endowed with $K_{t,t+2}$. Once 'old' the agent consumes the net income from savings as a unit of capital in period t returns $r_{t+1}(1 - \tau_i)$ where r_{t+1} is the rental rate in period $t + 1$, assuming a fully depreciation of capital. Last, define consumption in period $t + 1$ and $t + 2$ with β, the discount rate and τ_c the consumption tax rate to get the agent's problem:

$$\max_{C_{t+1},C_{t+2},K_{t+2}} ln(C_{t+1}) + \beta ln(C_{t+2}) \tag{5.A.2}$$

subject to

$$C_{t+1}(1 + \tau_c) + K_{t+2} \le w_{t+1}h_{t+1}(1 - \tau_l)$$

$$C_{t+2}(1 + \tau_c) \le (r_{t+2}(1 - \tau_i))K_{t+2}$$

$$C_{t+j} \ge 0, j = 1,2.$$

The agent's problem is solved, under optimal savings when:

$$K_{t+2} = \frac{\beta}{1 + \beta}(w_{t+1}h_{t+1}(1 - \tau_i)) \tag{5.A.3}$$

Firms

A single final good is generated by the representative firm on a competitive market[12], using a particular combination of human (L_t) and physical capital (K_t). A usual Cobb-Douglas function is assumed with $k_t \equiv \frac{K_t}{L_t}$:

$$Y_t = AK_t^\alpha L_t^{1-\alpha} \tag{5.A.4}$$

$$y_t \equiv \frac{Y_t}{L_t} = Ak_t^\alpha$$

where $\alpha \in [0,1]$ et $A > 0$. The firms hire until $r_t = A\alpha k_t^{\alpha-1}$ and

$$w_t = A(1 - \alpha)k_t^\alpha. \tag{5.A.5}$$

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[12]An individual firm is considered as a price taker

Gouvernment

Public expenditures are divided in two categories. A share e of output is dedicated to government expenditure on education:

$$E_t = \tilde{e}Y \tag{5.A.6}$$

Another share g is spent by the government but is seen as non-productive. We allow the government to finance part of the public expenditure through deficit spending, denoted by b, defined as e and g i.e., as a share of output.[13]

Taxes on labour & capital income (τ_i), consumption taxes (τ_c) plus borrowing (b) represent the three instruments used to finance public expenditures. Each period, the government budget must balance such that the government policy may be described as:

$$w_t h_t \tau_l + r_t \tau_k K_t + \tau_c (c_{t-1,t} + c_{t-2,t}) + \tau_p Y_t = (G + e) Y_t \tag{5.A.7}$$

Equilibrium and balanced growth

Definition 1 Given these different elements, a competitive equilibrium may be defined through consumption and portfolio holdings trade off by the representative agent $\{C_{t,t+1} + C_{t,t+2} K_{t,t+2}\}_{t=0}^{t=\infty}$; the firm chooses a specific set of inputs to end up with a given level of output $\{Y_t, K_t, L_t\}_{t=0}^{t=\infty}$; the government policy is set by the sequence $\{\tau_{i,t}, \tau_{c,t}, e_t, g_t, b_t\}_{t=0}^{t=\infty}$. Last, prices and initial conditions are respectively set by $\{w_t, r_t,\}_{t=0}^{t=\infty}$ and (K_0, h_0) such that:

(i) the agent's problem is solved, under the assumption of 'price taker' and a given government policy, when a period t learner chooses $C_{t,t+1}, C_{t,t+2}$ and $K_{t,t+2}$,

(ii) from the firm perspective, the profit maximisation issue, in period t, ends up with a level of Y_t, K_t and L_t constraint by a given set of prices, government policy and production possibilities (Eq. 5.A.4),

(iii) the government policy, under the balanced budget constraint, chooses $\{\tau_{i,t}, \tau_{c,t}, e_t, g_t, b_t\}$,

(iv) the stock of human capital, in each period evolves according to Eq. 5.A.1 and Eq. 5.A.6,

(v) the good market clears: $Y_t = (e_t + g_t + b_t) Y_t + C_{t-1,t} + C_{t-2,t} + K_{t-1,t+1}$

(vi) the capital market clears, and

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[13]We strictly follow Blankenau et al. (2007) and assume that g and b implicitly integrate the interest payments.

(vii) the labour market clears: $L_t = h_t$

Definition 2 Additional to definition 1, a balanced growth path satisfies the following properties:

(i) government policy is time invariant $\tau_i, \tau_c, e, g, b = \tau_{i,t}, \tau_{c,t}, e_t, g_t, b_t$;

(ii) the same and constant rate, γ defines the evolution of output, human and physical capital, consumption by both 'earners' and 'old'.

Thanks to definition 2, k_t, y_t, w_t and r_t are stationary (no need for time subscript). Using Eq. 5.A.1 and Eq. 5.A.6:

$$1 + \gamma = \xi(\tilde{e}Ak^{\alpha})^{\mu} \tag{5.A.8}$$

Equation 5.A.8 highlights the direct positive effect, on growth, of an increase in government education expenditure and by the same time, the ambiguous final impact given by the general equilibrium adjustments to k. From Eq. 5.A.8, it is possible to get γ as a function of τ_i:[14]

$$\gamma \approx \bar{\beta}_0 + \beta_1 e + \beta_2 \tau_i \tag{5.A.9}$$

where τ_i assumes a constant relationship on the balanced growth path between consumption and income tax revenue. By this way, introducing τ_i, in the growth equation, considers expenditure funding under distortionary taxation (Blankenau and Simpson, 2004; Blankenau et al., 2007)

Balanced growth

From Eq. 5.A.10, solving k as a function of policy instruments and the model parameters allow to understand the general equilibrium adjustments. Substituting Eq. 5.A.1, Eq. 5.A.5 and Eq. 5.A.6 into Eq. 5.A.3 yields:

$$K_{t+2} = \tilde{\beta}(A(1-\alpha)k_{t+1}^{\alpha}\xi(\tilde{e}y_t)^{\mu}h_t^{1-\mu}L_t^{\mu}(1-\tau_i))$$

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[14]Details from Eq. 5.A.8 to Eq. 5.A.9 are available in appendix 5.A.

Labour market clearing requires $L_t = h_t$ giving

$$k_{t+2} = \tilde{\beta}(A(1-\alpha)k_{t+1}^{\alpha}\xi(\tilde{e}y_t)^{\mu}(1-\tau_i))$$

At the steady state, solving for k:

$$k = [\tilde{\beta}A^{1-\mu}(1-\alpha)\xi\tilde{e}^{\mu}(1-\tau_i)]^{\frac{1}{1-\alpha-\alpha\mu}}$$

Using Eq. 5.A.8:

$$1+\gamma = A^{\mu}[\tilde{\beta}A^{1-\mu}(1-\alpha)]^{\frac{\alpha\mu}{1-\alpha(1+\mu)}}\xi^{\frac{1-\alpha}{1-\alpha(1+\mu)}}\tilde{e}^{\frac{\mu(1-\alpha)}{1-\alpha(1+\mu)}}(1-\tau_i)^{\frac{\alpha\mu}{1-\alpha(1+\mu)}} \tag{5.A.10}$$

taking the natural logarithm:

$$\gamma \approx \bar{\beta}_0 + \beta_1 e + \beta_2 \tau_i \tag{5.A.11}$$

where

$$\beta_1 = \frac{\mu(1-\alpha)}{1-\alpha(1+\mu)}, \beta_2 = -\frac{\alpha\mu}{1-\alpha(1+\mu)} \tag{5.A.12}$$

and $\bar{\beta}_0 = lnA^{\mu}[\tilde{\beta}A^{1-\mu}(1-\alpha)]^{\frac{\alpha\mu}{1-\alpha(1+\mu)}}\xi^{\frac{1-\alpha}{1-\alpha(1+\mu)}}$.

To find the relationship between e and τ_i, we use the government budget constraint Eq. 5.A.7:

$$\tau_i Y_t + \tau_c(C_{t-1,t} + C_{t-2,t}) = (e+g+b)Y_t$$

rewritten as

$$\tau_i + \tau_c \frac{\tilde{C}_t}{Y_t} = (e+g+b) \tag{5.A.13}$$

Let define $\phi = \frac{\tau_c \tilde{C}_t}{\tau_i Y_t}$ as the ratio of consumption to income tax revenue (constant in balanced growth):

$$\tau_i = \frac{e+g+b}{1+\phi} \tag{5.A.14}$$

substituting Eq. 5.A.14 in Eq. 5.A.11:

$$\gamma \approx \bar{\beta}_0 + \beta_1 e + \beta_2 \frac{e+g+b}{1+\phi} \tag{5.A.15}$$

5.B   Other regressions results

Table 5.5 – Robustness results

	(1) GMM	(2) Anderson Hsiao	(3) Schooling	(4) 10-yrs
L.GDP per capita	0.484***	0.665***	0.568***	0.766***
	(0.110)	(0.070)	(0.075)	(0.135)
Other Pub. Spend.	0.211*	0.249**	0.226**	0.221*
	(0.119)	(0.116)	(0.101)	(0.120)
Pub. Spend. Educ	0.127**	0.196**	0.157**	0.247*
	(0.062)	(0.087)	(0.066)	(0.128)
Taxes	0.043	-0.053	-0.015	-0.140***
	(0.036)	(0.064)	(0.059)	(0.049)
Gov. budget	0.017***	0.016***	0.011**	0.026***
	(0.006)	(0.006)	(0.005)	(0.006)
Expected human capital	0.027	0.176		-0.232
	(0.145)	(0.324)		(0.579)
Years of Schooling			0.005	
			(0.013)	
Nb observations	293.00	157.00	111.00	77.00
Nb groups	65.00	33.00	32.00	34.00

Notes: Standard errors in parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
Dependent variable, for all regressions is the five-years average of annual per capita GDP in log terms (except for column 4 which considers the 10-years average); Column 1 uses a GMM estimator to control for endogeneity. Regression 2 changes the initial first stage of LSDVC, with AH method. Standard errors are obtained thanks to a bootstrap variance-covariance matrix using 50 repetitions. Column three control for the human capital stock with years of schooling instead of expected human capital index. Column 4 looks for long term impact of public spending on growth.

5.C   List of countries

Upper-middle-income   :
Africa: Algeria, Botswana, Equatorial Guinea, Gabon, Libya, Mauritius, Namibia, South Africa; *Asia*: China, Fiji, Iran, Islamic Rep., Iraq, Jordan, Lebanon, Malaysia, Maldives, Samoa, Thailand, Turkey; *Commonwealth of independant States*: Armenia, Azerbaijan, Belarus, Kazakhstan, Russian Federation, Turkmenistan; *Europe*: Bulgaria, Romania; *America*: Belize, Brazil, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, Guatemala, Guyana, Jamaica, Mexico, Paraguay, Peru, Suriname, Venezuela, RB; *South-eastern-Europe*: Albania, Bosnia and Herzegovina, Montenegro, North Macedonia, Serbia,

High-income   :
Asia: Bahrain, Brunei Darussalam, Hong Kong SAR, China, Israel, Kuwait, Oman, Qatar, Saudi Arabia, Singapore, United Arab Emirates, Australia, Japan, New Zealand; *Europe*: Austria, Belgium, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, United Kingdom, Iceland, Norway, Switzerland; *America*: Argentina, The Bahamas, Barbados, Chile, Panama, Trinidad and Tobago, Uruguay, Canada, United States.

5.D   Variables definition: World Bank

GDP per capita: GDP per capita is gross domestic product divided by midyear population. GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Data are in constant 2010 U.S. dollars. Source World Bank national accounts data, and OECD National Accounts data files.

Government expenditure (% of GDP):   General government final consumption expenditure (formerly general government consumption) includes all government current expenditures for purchases of goods and services (including compensation of employees). It also includes most expenditures on national defense and security, but excludes government military expenditures that are part of government capital formation. Source World Bank national accounts data, and OECD National Accounts data files.

Government expenditure on education, total (% of GDP): Government expenditure on education is calculated by dividing total government expenditure for all levels of education by the GDP, and multiplying by 100. Aggregate data are based on World Bank estimates. Data on education are collected by the UNESCO Institute for Statistics from official responses to its annual education survey. All the data are mapped to the International Standard Classification of Education (ISCED) to ensure the comparability of education programs at the international level. The current version was formally adopted by UNESCO Member States in 2011. GDP data come from the World Bank. The reference years reflect the school year for which the data are presented. In some countries the school year spans two calendar years (for example, from September 2010 to June 2011); in these cases the reference year refers to the year in which the school year ended (2011 in the example).

Budget (% of GDP): Net lending (+) / net borrowing (–) equals government revenue minus expense, minus net investment in nonfinancial assets. It is also equal to the net result of transactions in financial assets and liabilities. Net lending/net borrowing is a summary measure indicating the extent to which government is either putting financial resources at the disposal of other sectors in the economy or abroad, or utilizing the financial resources generated by other sectors in the economy or from abroad. Source International Monetary Fund, Government Finance Statistics Yearbook and data files.

Taxes on income, profits and capital gains (% of revenue): Taxes on income, profits, and capital gains are levied on the actual or presumptive net income of individuals, on the profits of corporations and enterprises, and on capital gains, whether realized or not, on land, securities, and other assets. Intragovernmental payments are eliminated in consolidation. Source International Monetary Fund, Government Finance Statistics Yearbook and data files.

6 Conclusions

While Bulgaria and Croatia entered the ERM-II, during the Summer 2020, the development of the European Union, since its creation, more than half a century ago, seems to enter a self-sustaining process. However, economic challenges, social and societal progress continuously arise, increasing the multidimensionality of puzzles, from economic linkages to sovereign issues, from monetary union to fiscal transfers, from austerity to budgetary profligacy.

In the EU enlargements history, the CEECs act as a case study. They went through a profound metamorphosis, where market economy cuts the legs from under central planning, relegated to oblivion. To illustrate the importance of these transition economies, in the prolific economic literature, more than three hundred research articles, dedicated to the economics in the CEECs, are referenced on Science Direct.[1] The present dissertation empirically contributes, to the economic debate, bringing some elements to understand the context of the EU convergence process.

To understand, the economic framework, in which our work arises, chapter 1 details, how increasing welfare and well-being has led countries to increase international trade. Optimizing international inter-connections relies on institutional ingenuity, where integration benefits overcome costs. From trade to monetary unions, the peculiar case of the CEECs illustrates the challenges, pushing transition economies toward convergence. In the EU context, the last section of this chapter exposes the elements, that have driven our reflexion; from the monetary integration and exchange rate issues, toward the labour market dynamics and the labour supply flexibility.

Chapter 2 integrates the current discussion about the EA developments and the inter-

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[1] Source: Science direct from 1997 to 2021, https://www.sciencedirect.com.

national financial and monetary integration. From the EU entry toward the EA accession, there is only one step. We take a look at the specific position of the six last countries, member of the EU but on the verge of the EA (EU non-Euro countries). The main purpose was to apprehend the monetary spillovers, from the ECB monetary policy, toward other EU non-EA economies. Given their high multidimensional level of integration, we found as expected significant spillovers. Drawing a comparison between fixed and floating exchange rate regime, we highlight the ECB shocks on GDP variance, in floating economies. As expected, pegged countries import a significantly higher share of the ECB policy. In the more recent period, spillovers tend to decrease, to the benefit of the domestic monetary policy efficiency. This last point, under smoothed exchange rate adjustments, supports the monetary institutions credibility.

Chapter 3 is a response to the underlying domestic monetary policy efficiency. The Phillips curve describes the negative relationship between inflation rate and unemployment, as a stylized fact to corroborates the Central Bank efficiency. In the EA accession process, the exchange rate regime plays a strong role to, more or less, ties hand of the policymakers, regarding the monetary policy. From high inflation and unemployment, most of the CEECs, in a relatively short period, achieve both low inflation and unemployment. However, during the recent period (the last fifteen years), the CEECs registered relatively higher GDP growth rate, suggesting inflation pressures. We question whether the EA accession provides exogenous shock on the domestic monetary policy implementation. We focus on Baltic states, Slovenia and Slovakia, as these countries over the last twenty years, went through EU accession and the ERM-II to eventually join the EA. Until they entered the EA, we find a significant relationship, in line with the monetary autonomy. However, once the Euro, as a currency, is adopted, the loss of the monetary policy induces the lack of a significant Phillips curve. We associate this result to the fact that, in the monetary union, relatively smaller economies, are not strong enough, to influence the single monetary policy. This assumption is robust to the comparison, with EU economic leaders, who still have a significant Phillips curve slope.

Chapter 4 is related to the labour market. Until now, we highlighted some monetary issues and their subsequent effects toward the real economy (chapter 2) and upon the unemployment rate (chapter 3). In the context of a monetary union, the asymmetry of real shocks becomes crucial. A negative shock, that hit an economy, will be quickly smoothed, if labour mobility is high enough. In the EU, the migration cost (social, languages barriers) remains relatively high. As labour mobility may be an important driver to explain the labour market

dynamics, we try to understand the regional labour market adjustments, at the NUTS-II level. The main purpose of chapter 4 is to disentangle regional heterogenous behaviours following a shock on employment. Our results illustrate a more powerful unemployment channel, compared to what has been observed in the literature, relative to the wage one. The unemployment response takes more time to fly back to its long-term trend, in the CEECs. Leaving the EU-15 versus CEECs dichotomy, we point out a weaker resilience in poorer regions and over-reaction upon the women participation to the labour market.

To foster the labour supply flexibility and avoid persistence in negative employment shock, a solution is to prepare the labour supply to enter and to quickly adapt to the labour demand evolution. Chapter 5 tries to bring some answers to the labour market tightness described in chapter 4. To allow better shock absorption, we postulate that labour supply should increase flexibility. To reach such a target, we focus on the role of human capital. The economic theory shed some light on the importance, of human capital, to explain economic growth. However, financing human capital accumulation may deter the positive impact on growth. Using the growth theory, we were not able to find a significant impact, from PSE upon economic growth, in upper middle economies. However, once we introduce a measure of efficiency, in the public expenditure, we restore the results predicted by the theory of human capital. Such a result appears in countries with a relatively high efficiency level, i.e., PSE are positively and significantly associated with an increasing human capital. This chapter is important to the policymaker to make sure that increasing PSE is not enough. The primary purpose of PSE, in the growth theory, is to increase human capital. A coherent strategy, to provide education in line with the labour demand, should end up with lower labour mismatch and/or inefficiency upon the labour market.

Further developments   From our thesis emerged two main research questions, that could be further explored. Considering chapters 2 & 3, we do not introduce the banking and financial developments, which are nevertheless, deeply correlated to monetary policy development. The introduction briefly introduces the European banking system heterogeneity, with some of the CEECs particularly linked to other EU-15 countries thanks to international banks strategy. Questioning the role of the banking system (e.g., the credit channel of the monetary policy, cross-border lending) and concomitantly the financial integration, to foster economic development of the CEECs, may contribute to clarify the understanding of the challenges for the CEECs to fulfil their integration toward market economies.

Chapter 6. Conclusions

To answer chapters 4 & 5, resolutely anchored in the labour market functioning and the labour force education pending, further analyses may focus on the role of ALMP's to stimulate capital attractiveness and labour demand/supply matching process in a view of fostering the regional labour market resilience. This research path forces to apprehend the labour market through the prism of a common European market and the question of the European budgetary policy.

Concluding remarks   We mentioned, in the introduction, that political issues go beyond mere economic integration. Each EU-28 member-state, as an individual entity, contributes to the economic upturn, in an unprecedented political game. The introduction of the Euro, as a single currency, gave a lot of impetus to the European project. However, we have seen, that it may create more heterogeneities and challenges, to supervise almost 750 million of European citizens. The single currency impacts EU non-Euro members. We trace such impacts, from monetary issues to the labour market flexibility. In the European Union, for the Euro, not to be the Cain of this Abel, economic, political, social and societal concerns remain burning topics, to be analysed. Economic convergence, of heterogeneous countries, appears to be a long maze à la Deadalus where heterogeneities are the corner stone. Like Galaad's quest looked for the Holy Grail, in King Arthur legends, the European Union runs after economic interests, apology to international exchanges, ultimate dogma of more than half a century of peace.