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Saqib Ullah Khan

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This thesis is dedicated to my late father:
Zafrullah KHAN

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Introduction générale

Le commerce international est considéré comme une source de richesse et de pouvoir depuis les temps anciens, et les pays essaient toujours d'améliorer leurs échanges avec le reste du monde (Maddison (2001)). L'histoire du commerce international indique que les principaux pays commerçants ont acquis une domination politique au niveau régional, voire mondial. Les pays s'engagent dans le commerce international pour augmenter leur croissance malgré l'évolution des raisons particulières pour lesquelles le commerce international est source de bien-être. De nos jours, l'autarcie économique d'un pays et sa sortie du marché mondial sont pratiquement impossibles. En fait, les restrictions commerciales sont considérées comme la mesure économique la plus sévère que les pays s'imposent les uns aux autres, en cas de conflits.

L'intégration dans l'économie mondiale a été établie pour les pays comme une source efficace de développement, de la croissance économique et de la réduction de la pauvreté. Au cours des vingt dernières années, le commerce mondial a augmenté à un taux annuel moyen de 6 %, soit deux fois plus que la production mondiale. Par ailleurs, le commerce est une source de croissance depuis bien plus longtemps. Après la création de l'Accord Général sur les Tarifs Douaniers et le Commerce (AGETAC) en 1947, le système commercial mondial a bénéficié de huit cycles de libéralisation des échanges régionaux, unilatéraux et multilatéraux. En fait, le dernier cycle (connu sous le nom de « cycle de l'Uruguay » qui a eu lieu en 1994) a conduit à la création de l'Organisation Mondiale du Commerce (OMC).

L'intégration économique et le régionalisme dans le système commercial international ont connu un développement rapide depuis la création de l'Organisation mondiale du commerce (OMC). L'expansion rapide des accords commerciaux régionaux (ACR) a été la principale cause de la transformation de la politique commerciale de la plupart des pays au cours des dernières décennies. Depuis la création de l'OMC en 1994, le commerce international a connu une expansion rapide du nombre d'accords commerciaux. La participation aux ACR est généralisée : tous les pays de l'OMC sont actuellement membres d'au moins un ACR. En outre, les échanges favorisés par les ACR ont augmenté plus rapidement que le commerce mondial depuis 1990 ; par exemple, plus de 50 % des échanges ont été effectués à l'intérieur des ACR, alors qu'ils ne représentaient que 28 % en 1990 (Organisation Mondiale du Commerce, 2011). Malgré les crises économiques mondiales de

2008-2009, les pays ont maintenu le rythme des négociations des ACR, afin de conserver leur ouverture commerciale malgré les tensions politiques affectant l'accessibilité aux marchés (Organisation Mondiale du Commerce, 2011).

Certains spécialistes de l'économie internationale observent que l'accroissement mondial des ACR est en contradiction avec la pratique de la libéralisation du commerce multilatéral, car la création d'ACR ne confirme pas entièrement une augmentation du bien-être des pays et peut affecter les négociations du cycle de Doha (Bhagwati, 2008 ; Panagariya et Bhagwati, 1996). Cependant, l'hypothèse du partenaire commercial naturel de Krugman (1991) s'oppose à ce point de vue et prévoit que les ACR augmentent le bien-être s'ils sont créés entre des pays moins éloignés géographiquement. Cette théorie semble plus optimiste, car les pays géographiquement proches commercent de manière intensive en raison des faibles coûts commerciaux naturels. Les accords commerciaux régionaux sont toujours un sujet brûlant en économie internationale et les discussions politiques (Limo, 2016). La recherche sur ce domaine, en particulier, a toujours produit des résultats qui laissent perplexes. Pour reprendre les termes de Feenstra (2004, p. 197), par exemple, « les unions douanières et les accords de libre-échange (ALE) améliorant la richesse se produisent, mais nous ne devrions pas supposer que l'accord commercial régional dans la pratique est invariablement une bonne chose ». D'un autre côté, Baier et Bergstrand (2007) estiment que les partenaires commerciaux peuvent améliorer leur bien-être économique et tirer un grand profit de la libéralisation du commerce dans le cadre d'un ACR, car un accord de libre-échange (ALE) double généralement le commerce bilatéral entre deux nations membres au bout de dix ans. Cependant, au cours des trois dernières années, nous avons assisté à la montée en puissance de politiques commerciales qui étouffent le libre-échange et encouragent les mesures protectionnistes. Ces types de politiques sont surtout utilisés par les pays développés, comme le Royaume-Uni et les États-Unis. Le Royaume-Uni a choisi de quitter le marché unique européen, et les États-Unis ont choisi de retirer leur soutien au Partenariat transatlantique de commerce et d'investissement (TTIP) et de menacer le Mexique et le Canada d'une guerre commerciale dans le cadre de l'Accord de libre-échange nord-américain (ALENA). En outre, les États-Unis sont également engagés dans une véritable guerre commerciale avec la Chine. Toutefois, le développement de la création d'ACR suscite toujours un grand enthousiasme, qui s'est produit dans diverses régions et a engagé la plupart des économies au niveau mondial. Par exemple, l'Union européenne (UE) et la Turquie restent les négociateurs d'ACR les plus actifs en Europe ; en Asie, les négociateurs les plus actifs d'ACR sont le Singapour, la Chine,

le Japon et la Corée du Sud ; et le Chili est le négociateur d'ACR le plus actif en Amérique du Sud.

Les implications de la création d'un ACR sur les nations membres en termes d'amélioration du bien-être ont été abondamment explorés dans la littérature économique. La suppression des barrières commerciales permet aux consommateurs et aux producteurs de profiter des sources d'approvisionnement les moins chères et les plus compétitives, selon la théorie conventionnelle des avantages commerciaux (Ricardo, 1817 ; Samuelson, 1939). Un ACR devrait permettre de tirer des avantages du commerce, d'améliorer l'efficacité et d'accroître le bien-être des membres puisque les nations membres réduisent les obstacles au commerce entre elles. Les membres de l'ACR doivent bénéficier des accords commerciaux au détriment des non-membres (Haberler, 1936). Cependant, Viner (1950) a été le premier à examiner les impacts du développement des ACR et à remettre en question la théorie traditionnelle. Il a discuté des effets de création et de détournement de commerce et a affirmé qu'un ACR n'améliore pas toujours le bien-être des pays membres. Selon Viner, les ACR sont plus susceptibles d'entraîner une création de commerce si les produits nationaux à coût élevé peuvent être remplacés par des importations à moindre coût en provenance d'un pays partenaire. Dans cette situation, les ACR favorisent le bien-être des pays membres en augmentant l'efficacité de la production et de la consommation. D'un autre côté, les accords commerciaux régionaux peuvent entraîner un détournement de commerce lorsque les importations de biens à faible coût passent des fabricants à faible coût à des fabricants à coût plus élevé (fournisseurs inefficaces) en raison de la formation de l'ACR. Cette situation entraîne des inefficacités dans la production mondiale, ce qui réduit le surplus du consommateur dans les pays membres et les fabricants externes des ACR. Le détournement de commerce est susceptible d'entraîner des pertes de bien-être, non seulement pour le reste du monde mais aussi pour les États membres. Selon Viner (1950), l'impact net de la libéralisation des échanges découlant de la création d'ACR est équivoque et dépend de la force relative des effets de création et de détournement des échanges. Selon lui, « lorsque la force créatrice de commerce est prédominante, l'un des membres au moins doit en bénéficier, les deux peuvent en bénéficier, les deux combinés doivent avoir un avantage net, et le monde en général en bénéficie ; mais le monde extérieur y perd, du moins à court terme. Lorsque l'effet de détournement des échanges est prédominant, l'un des membres au moins doit être lésé, les deux peuvent être lésés, les deux combinés doivent avoir un bénéfice net, et le monde dans son ensemble en bénéficie, et il y aura un préjudice pour le monde extérieur et le monde dans son ensemble ». Plus tard, des chercheurs ont tenter de dissiper l'incertitude entourant les

conclusions de Viner sur les impacts statiques des accords commerciaux. Un ACR est susceptible de provoquer un effet d'amélioration du bien-être pour les pays membres si les tarifs extérieurs sont gérés après la formation de l'ACR pour maintenir le commerce international avec les non-membres (Kemp et Wan, 1976 ; Meade, 1955). De même, Wonnacott et Lutz (1989) et Krugman (1991) suggèrent que les ACR peuvent stimuler la création de commerce et augmenter les avantages en termes de bien-être en se basant sur l'idée de « partenaire commercial naturel ».

Les effets de création et de détournement de commerce résultant du développement des ACR sont également largement étudiés dans la littérature empirique sur le commerce international. Les modèles de gravité sont utilisés dans la majorité des recherches pour examiner ces effets commerciaux. Ces modèles améliorent la configuration de l'équation de gravité pour estimer de manière appropriée les variables qui montrent si le commerce des nations membres de l'ACR au sein de la région et avec les étrangers est supérieur ou inférieur aux niveaux prévus. La plupart des évaluations révèlent que les ACR ont des effets bénéfiques importants sur le commerce intrarégional, avec des conséquences mitigées en termes de création et de détournement de commerce sur le commerce des pays non-membres (Frankel, 1997 ; Soloaga et Winters, 2001 ; Carrère, 2006 ; Magee, 2008 ; Troignon, 2010). Ces travaux de recherche agrègent les flux commerciaux et supposent l'effet uniforme de l'élimination/réduction des droits de douane sur les flux commerciaux des différentes industries. Cependant, l'impact de l'élimination/réduction des droits de douane peut être différent selon les industries. Par conséquent, ces études peuvent souffrir d'un biais d'agrégation en utilisant des flux commerciaux agrégés ou semi-agrégés. Il est donc nécessaire de procéder à une analyse désagrégée pour examiner l'impact de la suppression des droits de douane sur les flux commerciaux des industries afin de remédier au biais d'agrégation. L'analyse au niveau désagrégé permet aux chercheurs de connaître en détail les effets des ACR sur le commerce.

Si les ACR favorisent l'intégration commerciale dans la région, cela soulève des questions sur la façon dont elle affecte la croissance de la production du partenaire commercial. En particulier, une plus grande intégration commerciale oriente-t-elle les économies vers une synchronisation du cycle économique?

Le lien entre l'intensité des échanges et la synchronisation du cycle économique a fait l'objet de nombreuses recherches, soutenu en grande partie par la littérature sur les Zones Monétaires Optimales (ZMO), développée par Mundell (1961) et à laquelle Frankel et Rose

(1998) ont apporté une nouvelle touche¹. Selon cette théorie, l'augmentation des échanges entre deux partenaires commerciaux modifie la structure du cycle économique (Frankel et Rose, 1998). D'un point de vue théorique, une intensité commerciale plus élevée entraîne un co-mouvement plus fort ou plus faible des cycles économiques. Les pays peuvent se spécialiser dans la production d'un produit particulier pour lequel ils ont un avantage comparatif si les liens commerciaux internationaux sont plus étroits. Dans ce cas, les pays peuvent être plus vulnérables aux chocs spécifiques à l'industrie, ce qui entraîne des cycles économiques idiosyncrasiques. D'autre part, les chocs de demande favorisent la synchronisation des cycles économiques si le commerce intra-industriel est dominant. Dans ce dernier cas, la plus grande intensité du commerce entre les partenaires commerciaux bilatéraux favorise le co-mouvement du cycle économique.

Le resserrement des liens commerciaux stimulant la synchronisation des cycles économiques, il ouvre la voie à l'adhésion des pays à une union monétaire puisqu'ils remplissent désormais les critères de la zone monétaire optimale (ZMO) (Frankel et Rose, 1998). Selon Frankel et Rose (1998), la formation/adhésion à une union monétaire diminue les risques de chocs asymétriques entre les pays membres et réduit la nécessité d'une politique monétaire spécifique à chaque pays. La formation d'une union monétaire diminue les coûts de transaction, supprime les fluctuations du taux de change, élimine la segmentation du marché et introduit la concurrence par les prix. En d'autres termes, l'union monétaire encourage le commerce bilatéral, l'intégration financière et économique et l'accumulation de connaissances (De Grauwe et Mongelli, 2005).

Après la présentation de la théorie endogène par Frankel et Rose (1998), plusieurs études ont tenté d'examiner empiriquement l'impact de l'intensité des échanges sur la synchronisation des cycles économiques et ont trouvé un lien positif entre ces deux variables (par exemple, Shin et Wang, 2003 ; Inklaar et al., 2008 ; Eggoh et Belhadj, 2015). Cependant, ces études utilisent des données commerciales brutes pour calculer l'intensité des échanges, ce qui peut ne pas être approprié. Ces types d'études peuvent fournir des résultats biaisés car le commerce brut peut être surévalué. Les données commerciales brutes donnent une image déformée car le commerce des biens intermédiaires représente deux tiers du commerce total

¹ Mundell (1961) présente la théorie de l'OCA (Optimum currency Area) et établit certains critères avant de rejoindre une union monétaire. Il se concentre sur la mobilité du travail, la flexibilité des prix, l'intégration financière et les chocs symétriques. D'autre part, Frankel et Rose (1998) présentent la théorie endogène de l'OCA et Frankel et Rose (1998) postulent que les pays peuvent augmenter l'intensité de leur commerce et promouvoir la synchronisation de leur cycle économique une fois qu'ils font une union. Ainsi, si un pays ne remplit pas le critère ex-ante, il peut le remplir ex-post.

(Johnson et Noguera, 2012). En raison de la chaîne d'approvisionnement mondiale, le produit traverse les frontières plusieurs fois sous la forme de produits intermédiaires dans le processus de production.² Les données commerciales peuvent surestimer le contenu domestique des exportations en raison du double comptage, car le commerce brut mesure les statistiques commerciales à chaque frontière au lieu de la valeur ajoutée nette (Duval et al., 2016). Une fonction de production multi-pays peut exister en dehors du double comptage, et les biens intermédiaires peuvent emprunter un chemin indirect pour atteindre leur destination finale. L'utilisation de données commerciales brutes pour calculer l'intensité des échanges peut conduire à des résultats biaisés. Il est donc nécessaire de mesurer l'intensité des échanges en utilisant la valeur ajoutée du commerce, qui donne des résultats précis.

Comme expliqué précédemment, l'effet de bien-être du commerce augmente en éliminant les barrières commerciales. Les pays membres ont également accès à un marché plus large et peuvent vendre davantage de marchandises grâce au libre-échange. Cependant, la formation d'un ACR crée également une concurrence pour l'industrie nationale, car les pays ne peuvent plus efficacement protéger leurs industries par des droits de douane ou d'autres mesures de protection. La pression devient plus forte si les industries sont inefficaces et peu compétitives, et absorbe une main-d'œuvre importante. La question se pose alors de savoir comment un pays peut accroître la compétitivité d'une industrie inefficace et protéger la main-d'œuvre du chômage. Depuis des décennies, la compétitivité internationale d'une économie et son expansion jouent un rôle dans la politique.

La compétitivité mondiale est décrite comme la capacité d'un pays à utiliser rationnellement ses ressources en fonction de la spécialisation et du commerce mondial, de manière à améliorer le produit intérieur et le niveau de vie. Sur le plan théorique, la perception de la compétitivité est généralement liée à la théorie des avantages comparatifs. Les décideurs politiques considèrent le taux de change et les prix relatifs comme des facteurs importants pour déterminer les flux commerciaux d'un pays. Il est intéressant pour eux de connaître le rôle du taux de change et des prix relatifs dans l'ajustement du choc des flux commerciaux. Supposons que les exportations d'un pays diminuent en raison d'une faible demande sur le marché mondial. Dans ce cas, le pays voit la politique efficace entre la dépréciation du taux de change et la diminution des prix relatifs par le biais de subventions. Ces deux politiques, à savoir, la baisse des prix relatifs et la dépréciation du taux de change, sont des options

² Dans la chaîne d'approvisionnement, chaque fabricant achète un produit (matière première, etc.) et contribue ensuite à sa valeur. La valeur ajoutée est le prix payé au facteur de production dans chaque pays exportateur.

importantes et recommandées pour être compétitif dans de telles conditions et corriger le problème de la balance commerciale. A cet égard, Orcutt (1950) estime que les flux commerciaux répondent plus rapidement aux changements du taux de change qu'aux changements des prix relatifs. Si les flux commerciaux réagissent plus rapidement au taux de change qu'aux prix relatifs, c'est-à-dire que l'hypothèse d'Orcutt se vérifie, la politique de dépréciation du taux de change convient mieux à un pays qu'une politique commerciale pour être compétitif. En outre, la dépréciation du taux de change permet également d'ajuster le déficit du compte courant d'un pays. La dépréciation du taux de change causée par un choc monétaire positif crée un effet de déplacement de la consommation, en faisant basculer la demande mondiale des biens produits à l'extérieur vers les biens produits dans le pays. Plus précisément, elle rend les exportations moins chères et augmente le prix des biens importés, rendant les exportations d'un pays plus compétitives³.

Principaux objectifs de la thèse

L'objectif général de la thèse est d'analyser certains aspects macroéconomiques de l'intégration commerciale. Les divergences empiriques soulevées dans les recherches antérieures nous amènent aux objectifs clés de notre thèse. Nous abordons ces objectifs dans nos différents chapitres.

Le premier objectif spécifique de notre thèse est d'examiner l'effet de création et de détournement de commerce des accords commerciaux régionaux. Au lieu de mesurer les effets commerciaux au niveau global, nous utilisons des flux commerciaux désagrégés. Dans l'analyse, notre objectif est d'analyser les effets de création et de détournement de commerce des ACR pour les industries car la réponse de l'élimination/réduction des tarifs peut être différente pour différentes industries.

Le deuxième objectif spécifique est d'analyser le lien entre l'intensité du commerce et la synchronisation du cycle économique. En outre, nous cherchons également à savoir si la coordination des politiques fiscales et monétaires favorise ou non les cycles économiques.

³ La dépréciation du taux de change affecte également la synchronisation du cycle économique. Comme la dépréciation de la monnaie nationale déplace les dépenses globales des biens étrangers vers les biens nationaux, elle augmente la production nationale et diminue la production étrangère. Par conséquent, nous pouvons dire qu'elle crée une synchronisation négative du cycle économique entre les pays. Cependant, si l'effet de transmission de la dépréciation de la monnaie est faible, l'inverse peut se produire et augmenter la synchronisation du cycle économique.

Le troisième objectif spécifique de notre thèse est d'explorer la meilleure politique entre la dépréciation du taux de change et la réduction des prix relatifs pour être compétitif sur le marché international. Pour ce faire, nous analysons l'hypothèse d'Orcutt, qui examine la réponse des flux commerciaux aux changements du taux de change et des prix relatifs.

Approche méthodologique et outils d'analyse

Cette thèse est divisée en trois chapitres afin de répondre aux objectifs de recherche fixés. La structure générale adoptée dans chaque chapitre de cette thèse consiste à présenter une brève revue de la littérature qui permet d'identifier les principaux axes autour desquels s'articulent les discussions sur le sujet, la méthodologie utilisée dans le chapitre et les résultats obtenus.

Le premier chapitre se concentre sur les effets commerciaux des accords commerciaux régionaux. Plus précisément, nous nous concentrons sur les implications des ACR en termes de création et de détournement de commerce. Les études précédentes s'appuient sur des données commerciales globales et supposent un impact uniforme de la formation d'ACR sur le commerce des différentes industries. L'effet de l'élimination/réduction des droits de douane peut être différent selon les industries. Il n'y a que quelques études qui explorent les effets des ACR au niveau désagrégé. Cependant, toutes ces études effectuent une analyse pour un groupe de produits spécifiques. Dans notre chapitre, nous analysons les effets commerciaux des ACR au niveau désagrégé et explorons les effets de création et de détournement de commerce pour toutes les industries. Deux autres limites ne sont pas non plus abordées dans la majeure partie de la littérature. Il s'agit des flux commerciaux nuls et de l'endogénéité (hétérogénéité des paires de pays) entre les partenaires commerciaux⁴. Pour traiter ces questions, nous utilisons l'estimateur de pseudo-maximum de vraisemblance de Poisson à effet fixe (PPML) qui estime le modèle sous forme multiplicative⁵. Au nombre de En particulier, nous utilisons l'estimateur

⁴ L'absence de commerce peut être due à plusieurs raisons. Premièrement, le commerce zéro se produit s'il n'y a pas de commerce réel entre deux pays. Cela peut être dû à des coûts variables et fixes importants entre deux pays. Deuxièmement, les flux commerciaux nuls peuvent être le résultat d'erreurs d'arrondi. Si les flux commerciaux sont mesurés en milliers de dollars, la valeur commerciale peut être enregistrée comme nulle si elle est inférieure à un certain seuil. En particulier, les valeurs commerciales nulles peuvent se produire fréquemment lorsque nous utilisons des données commerciales désagrégées. Troisièmement, les zéros peuvent être dus à des informations manquantes qui sont enregistrées à tort comme des zéros (Silva et Tenreyro, 2006).

⁵ L'utilisation de l'estimateur PPML présente plusieurs avantages. Premièrement, il traite les flux commerciaux nuls en estimant le modèle sous forme multiplicative. Deuxièmement, il est inapproprié de prendre le logarithme de la variable dépendante en présence d'hétéroscédasticité car le résultat peut conduire à une conclusion ambiguë (Silva et Tenreyro, 2006). L'estimateur PPML traite efficacement les données hétéroscédastiques grâce à sa fonction de robustesse intégrée. Troisièmement, nous pouvons interpréter ses résultats comme une élasticité selon la spécification de son modèle semi-logarithmique (Urata et Okabe, 2014).

PPML à effet fixe pour l'équation de gravité et mobilisons un panel de cinquante-cinq pays (55) sur la période 2000-2018 pour capter les effets commerciaux de l'UE, de l'ALENA et de l'ASEAN.

Après avoir évalué les effets des accords commerciaux régionaux sur le commerce dans le premier chapitre, nous passons au *chapitre deux* et nous concentrons sur notre deuxième objectif. Le deuxième chapitre explore le lien entre la synchronisation du cycle économique, l'intensité des échanges et la coordination des politiques. Contrairement aux études précédentes qui mesurent l'intensité des échanges en termes bruts, nous utilisons des données sur le commerce à valeur ajoutée pour calculer la variable de manière plus précise⁶. Cependant, pour comparer nos résultats avec les études précédentes, nous mesurons l'intensité des échanges en termes bruts et explorons sa relation avec la synchronisation du cycle économique dans notre première étape. Dans notre deuxième étape, nous remplaçons cette intensité commerciale (brute) par une nouvelle variable calculée à partir de l'intensité commerciale (en termes de valeur ajoutée) afin de résoudre le problème de mesure. Outre le lien entre l'intensité commerciale et la synchronisation du cycle économique en Asie de l'Est, nous examinons également l'impact de la coordination des politiques et de la volatilité du taux de change sur la synchronisation du cycle économique. Nous utilisons des données de panel de dix pays d'Asie de l'Est et appliquons les effets fixes pour voir si la région remplit le critère ex-post de ZMO.

Nous abordons notre troisième objectif dans le *troisième chapitre* et analysons l'hypothèse d'Orcutt en Asie de l'Est. Deux types de méthodes sont utilisées pour analyser l'hypothèse d'Orcutt dans la littérature. La première méthode analyse l'hypothèse d'Orcutt en imposant la structure des retards sur le taux de change nominal et les prix relatifs. L'acceptation ou le rejet de l'hypothèse d'Orcutt dépend de la structure de retard imposée à chaque variable. L'hypothèse d'Orcutt est acceptée dans ce processus si le taux de change nominal prend moins de retards que les prix relatifs. La deuxième méthode utilise la fonction de réponse impulsionnelle pour évaluer l'hypothèse d'Orcutt en analysant la réponse impulsionnelle des flux d'exportation et d'importation aux variations du taux de change et des prix relatifs. L'hypothèse d'Orcutt se vérifie si le taux de change réagit plus rapidement aux flux commerciaux que la variation des prix relatifs. En d'autres termes, l'accent est mis sur l'analyse du retard de décalage temporel de chaque flux commercial aux chocs du taux de change et des

⁶ Dans les périodes récentes, les produits traversent les frontières plusieurs fois en raison de l'importance croissante de la chaîne d'approvisionnement. Dans ce cas, les données du commerce brut peuvent refléter un terme surévalué en raison du double comptage. En outre, ce sont les exportations à valeur ajoutée qui contribuent au produit intérieur brut (PIB) d'un pays plutôt que les exportations brutes.

prix relatifs. Nous utilisons les données de séries temporelles de huit pays d'Asie de l'Est sur la période 1990-2020 et appliquons l'approche de test des limites de l'ARDL (Auto-Regressive Distributed Lag) pour examiner l'hypothèse d'Orcutt, qui présente certains avantages par rapport aux autres techniques⁷. Nous obtenons les résultats à court terme à partir de la première partie de l'équation ARDL (c'est-à-dire les variables sous forme de différence) et obtenons les résultats à long terme à partir des variables retardées. À cette fin, nous utilisons le critère d'information d'Akaike (AIC) pour sélectionner le modèle optimal dans la première étape ARDL. Nous comparons les résultats à court terme du taux de change et des prix relatifs pour évaluer l'hypothèse d'Orcutt. En outre, nous utilisons également la fonction de réponse impulsionnelle (IRF) pour analyser l'hypothèse d'Orcutt et obtenir un résultat robuste. Nous dérivons la fonction de réponse impulsionnelle en appliquant l'analyse auto-régressive vectorielle (VAR) et utilisons le critère d'information d'Akaike (AIC) pour sélectionner le décalage optimal pour l'analyse VAR.

Structure de la thèse

Compte tenu des objectifs susmentionnés, la thèse est divisée en trois chapitres. Le *premier chapitre* discute et analyse le premier objectif de notre thèse. Dans ce chapitre, nous présentons l'histoire de l'Accord général sur les tarifs douaniers et le commerce (GATT) qui a été établi en 1947 pour éliminer les barrières commerciales et promouvoir le commerce international. Nous abordons les différents cycles de négociations dans le cadre du GATT et la création de l'Organisation mondiale du commerce (OMC). Nous examinons également les différents types d'accords commerciaux régionaux et leurs effets possibles. Dans ces effets commerciaux, nous nous concentrons sur la création de commerce, le détournement de commerce et les effets commerciaux nets qui découlent de la formation d'un accord commercial régional. Notre objectif spécifique est de comprendre pourquoi ces effets commerciaux se produisent. Pourquoi certains ACR entraînent-ils une création de commerce et d'autres un détournement de commerce ? La troisième section du premier chapitre présente les études empiriques qui se concentrent sur la création et le détournement du commerce. Les études empiriques sont divisées en deux groupes, à savoir les études au niveau agrégé et les études au

⁷ Le principal avantage de l'utilisation de l'approche ARDL est qu'elle peut être appliquée indépendamment de l'existence de $I(0)$ et $I(1)$. Pesaran et al. (2001) proposent deux nouvelles valeurs critiques pour le test F (c'est-à-dire $I(0)$ et $I(1)$) pour examiner la cointégration. Ils proposent la valeur limite supérieure $I(1)$ du test F en supposant que toutes les variables sont intégrées d'ordre un, et une valeur limite inférieure $I(0)$ en considérant que toutes les variables sont intégrées d'ordre zéro. Les variables sont supposées être cointégrées (c'est-à-dire avoir une relation à long terme) si la valeur de la statistique F est supérieure à la valeur de la borne supérieure.

niveau désagrégé. Cela nous permet de connaître les principaux liens théoriques et de prendre en compte les limites empiriques des études précédentes. Notre analyse explore l'effet des ACR sur le commerce au niveau désagrégé et nous permet de connaître l'effet de création et de détournement de commerce pour toutes les industries. La quatrième section du premier chapitre explique la méthodologie que nous utilisons pour évaluer l'effet de création et de détournement de commerce des ACR sélectionnés. Les résultats sont donnés dans la section 5. En utilisant les données commerciales agrégées, nous constatons que les accords commerciaux régionaux entraînent la création de commerce et augmentent l'effet de bien-être du commerce. Pour étudier en détail les impacts commerciaux de ces ACR, nous effectuons une analyse désagrégée. Les résultats obtenus au niveau des industries confirment l'effet de la création de commerce dans 60% des industries de l'UE, 80% des industries de l'ALENA, tandis que la création de commerce est trouvée dans toutes les industries de l'ASEAN. En outre, l'étude révèle un impact significatif des autres variables de gravité sur les flux commerciaux. Le PIB et la population des deux pays déterminent de manière significative leur commerce bilatéral. La distance, qui représente le coût du commerce, présente un signe négatif et affecte significativement les flux commerciaux agrégés et désagrégés.

Après avoir évalué les effets des accords commerciaux régionaux sur le commerce, nous passons à votre deuxième objectif dans le *chapitre deux*. Le deuxième chapitre explore le lien entre la synchronisation du cycle économique, l'intensité des échanges et la coordination des politiques. En outre, ce chapitre aborde également les différents critères de la zone monétaire optimale (ZMO) et investigate si l'Asie de l'Est les remplit ou non. Dans les première et deuxième parties du chapitre deux, nous présentons les liens théoriques de la synchronisation du cycle économique avec différentes variables et expliquons le contexte théorique de la théorie ZMO. Ces variables comprennent l'intensité du commerce, le commerce intra-industriel, la coordination des politiques fiscales et monétaires et la volatilité du taux de change. La théorie ZMO suggère plusieurs critères pour un candidat potentiel avant de rejoindre une union monétaire. Ces critères comprennent la mobilité de la main-d'œuvre, la flexibilité des prix et des salaires, la synchronisation des cycles économiques, l'intensité du commerce bilatéral, l'intégration fiscale et la structure de production (Mundell, 1961; MacKinnon, 1963; Kenen, 1969). La théorie traditionnelle suggère qu'une zone devrait être optimale avant de rejoindre une union monétaire et un régime de taux de change fixe. Cependant, Mundell (1973a, 1973b) remet en cause le prérequis qu'il avait lui-même donné à la théorie traditionnelle puisqu'il estime que l'adoption du taux de change fixe et la formation d'une union monétaire introduisent l'optimalité dans une zone économique. Frankel et Rose (1998) utilisent la perception de

Mundell (1973) et présentent la théorie endogène de la zone monétaire optimale. Selon eux, la formation d'une union monétaire diminue les coûts de transaction, supprime les fluctuations du taux de change, élimine la segmentation du marché et introduit la concurrence par les prix. De plus, ils estiment que si un pays ne satisfait pas aux critères de la ZMO ex ante, il peut le faire ex post. La théorie endogène de la zone monétaire optimale décrit que la formation/adhésion d'une union monétaire diminue les risques de chocs asymétriques entre les pays membres et réduit la nécessité d'une politique monétaire spécifique à chaque pays et souveraine. La deuxième partie de la section deux présente la revue de la littérature empirique. Cela nous permet de comprendre la base théorique et les divergences des études précédentes. La littérature se concentre sur le travail de Frankel et Rose (1998) et explore le lien entre l'intensité du commerce et la synchronisation du cycle économique. Cependant, les études de la littérature souffrent d'un problème commun car elles utilisent les données du commerce brut au lieu de celles du commerce à valeur ajoutée. De nos jours, les produits traversent les frontières plusieurs fois en raison de l'importance croissante de la chaîne d'approvisionnement. Dans un tel cas, les données du commerce brut peuvent refléter un terme surévalué en raison du double comptage. En outre, ce sont les exportations à valeur ajoutée qui contribuent au produit intérieur brut (PIB) d'un pays plutôt que les exportations brutes. La section trois du chapitre deux présente la construction des variables, les données et la méthodologie. Nous calculons l'intensité des échanges de plusieurs façons et nous vérifions si les résultats sont sensibles à la méthode de calcul. Afin de comparer nos résultats avec les études précédentes, nous mesurons l'intensité des échanges en termes bruts et explorons sa relation avec la synchronisation du cycle économique dans notre première étape. Dans notre deuxième étape, nous remplaçons cette intensité commerciale (brute) par la variable nouvellement calculée de l'intensité commerciale en valeur ajoutée afin de résoudre le problème de mesure. Outre le lien entre l'intensité du commerce et la synchronisation du cycle économique en Asie de l'Est, nous observons également l'impact de la coordination des politiques et de la volatilité du taux de change sur la synchronisation du cycle économique. En utilisant un effet fixe par paire de pays et par année, nous constatons que l'intensité commerciale à valeur ajoutée est le principal moteur de la synchronisation du cycle économique dans la région de l'Asie de l'Est plutôt que l'intensité commerciale brute. De même, la coordination des politiques monétaires et fiscales en Asie de l'Est favorise également la synchronisation de leur cycle économique. Les résultats du chapitre deux sont donnés dans la section quatre. La troisième et la quatrième section du chapitre trois présentent respectivement la méthodologie et les résultats. Nous obtenons un effet significatif de l'intensité du commerce sur la synchronisation du cycle économique dans

la région. Ce résultat est dû à la chaîne d'approvisionnement croissante en Asie de l'Est et dans l'ASEAN. Cela indique également que le commerce à valeur ajoutée est à l'origine des mouvements du cycle économique plutôt que du commerce brut. Nos résultats montrent également l'importance du commerce intra-sectoriel, qui est également un déterminant clé de l'harmonisation du cycle économique de la région. Après l'inclusion d'autres variables de contrôle, les résultats restent les mêmes. La volatilité des taux de change, l'intégration financière et la coordination des politiques sont également essentielles pour promouvoir la synchronisation du cycle économique dans la région.

Dans notre troisième chapitre, nous abordons notre troisième objectif et analysons l'hypothèse d'Orcutt en Asie de l'Est. Orcutt (1950) pense que les flux commerciaux répondent plus rapidement aux variations du taux de change qu'aux variations des prix relatifs. Dans la première partie de ce chapitre, nous expliquons le fondement théorique de l'hypothèse d'Orcutt (1950). Nous décrivons les différents retards qui contribuent à l'hypothèse d'Orcutt et expliquons pourquoi les flux commerciaux réagissent plus rapidement à la variation du taux de change qu'à celle des prix relatifs dans la première section. La deuxième section de ce chapitre présente les études empiriques qui nous permettent de trouver une lacune dans la recherche. La troisième section du chapitre présente la méthodologie. Deux types de méthodes sont utilisés pour analyser l'hypothèse d'Orcutt. La première méthode analyse l'hypothèse d'Orcutt en imposant la structure des retards sur le taux de change nominal et les prix relatifs. L'hypothèse d'Orcutt est acceptée dans ce processus si le taux de change nominal a des retards plus courts que les prix relatifs. La deuxième méthode utilise la fonction de réponse impulsionnelle pour évaluer l'hypothèse d'Orcutt en analysant la réponse impulsionnelle des flux d'exportation et d'importation aux variations du taux de change et des prix relatifs. L'hypothèse d'Orcutt se vérifie si le taux de change réagit plus rapidement aux flux commerciaux qu'à la variation des prix relatifs. En d'autres termes, l'accent est mis sur l'analyse de la longueur du décalage temporel de chaque flux commercial aux chocs du taux de change et des prix relatifs. Notre analyse utilise la méthode de test des limites ARDL (Auto-Regressive Distributed Lag) pour examiner l'hypothèse d'Orcutt, qui présente certains avantages par rapport aux autres techniques. Le principal avantage de l'approche ARDL est qu'elle peut être appliquée indépendamment de l'existence de $I(0)$ et $I(1)$. Les variables sont supposées être cointégrées (c'est-à-dire avoir une relation à long terme) si la valeur de la statistique F est supérieure à la valeur de la limite supérieure proposée par Pesaran et al. (2001). Nous obtenons les résultats à court terme à partir de la première partie de l'équation ARDL (c'est-à-dire les variables sous forme de différence) et obtenons les résultats à long terme à partir des variables retardées. Nous

présentons les résultats du modèle estimé dans la section 4. À cette fin, nous utilisons le critère d'information d'Akaike (AIC) pour sélectionner le modèle optimal dans la première étape ARDL. Nous comparons les résultats à court terme du taux de change et des prix relatifs pour évaluer l'hypothèse d'Orcutt. Les résultats de l'étude révèlent que les exportations de cinq pays répondent plus rapidement aux variations du taux de change qu'à celles du prix relatif et confirment l'hypothèse d'Orcutt. De même, l'estimation de l'équation d'importation soutient également l'hypothèse d'Orcutt dans cinq pays . En bref, nos résultats indiquent que l'hypothèse d'Orcutt est soutenue en général, et que les flux commerciaux réagissent plus rapidement aux variations du taux de change qu'aux prix relatifs.

General introduction

International trade is considered a source of wealth and power since ancient times, and countries always try to enhance their exchange with the rest of the world (Maddison (2001). The history of international trade indicates that prominent trading countries have gained political dominance regionally or even globally. Countries engage in international trade to increase their growth despite the evolvement of particular reasons for which international trade results in welfare. Currently, the economic segregation of a country and its exit from the global market is practically impossible. In fact, trade restrictions are considered the toughest economic measure countries enforce on one another in case of conflict.

Integration into the global economy has been established for countries as an effective source of stimulating development, economic growth, and poverty alleviation. Over the last twenty years, global trade has grown at an average rate of 6%, double than the rate of global output. However, trade has been a source of growth for much longer. Since the establishment of the General Agreement on Tariffs and Trade (GATT) in 1947, the global trading system has gained from eight rounds of regional, unilateral, and multilateral trade liberalization. In fact, the last round (known as the "Uruguay Round" that took place in 1994) headed to the creation of the "World Trade Organization (WTO)." to administer the increasing body of trade agreements.

The economic integration and regionalism in the international trading system have expanded like wildfire since the establishment of the World Trade Organization (WTO). The fast expansion of regional trade agreements (RTAs) has been the main cause of trade policy transformation for most countries in the last few decades. Since the establishment of the WTO, international trade has observed a rapid expansion in the number of trade agreements. Involvement in RTAs is widespread: all member countries of the WTO presently are members of at least one RTA in force. Furthermore, trade transmitted via RTAs has increased quicker than world trade since 1990; subsequently, more than 50% of trade was conducted in the interior of RTAs, which was only 28% in 1990 (World Trade Organization, 2011). Despite the global economic crises of 2008-2009, countries maintained the pace of negotiation and resulting RTAs to keep their trade openness despite political tensions affecting market accessibility (World Trade Organization, 2011).

Some international economics scholars observe the global spread of the RTAs system contradictory with the practice of multilateral trade liberalization since the creation of RTAs does not entirely confirm an increase in countries' welfare and may affect the Doha round negotiations (Bhagwati, 2008; Panagariya and Bhagwati, 1996). However, Krugman's (1991) natural trading partner hypothesis opposed this point of view and expects that RTAs increase the welfare if they are created among countries with less geographical distance. This theory looks more optimistic as geographically closed countries do trade intensively because of low natural trading costs.

Regional trade agreements are still a hot topic in international economic research and policy discussions (Limo, 2016). Research on this area, in particular, has always produced perplexing findings. In the word of Feenstra (2004, p. 197), for example, *"Wealth-improving customs unions and FTAs occur, but we should not assume that regional trade agreement in practice is invariably a good thing."* On the other hand, Baier and Bergstrand (2007) believe that trading partners can enhance their economic welfare and gain a lot from trade liberalization through the RTA framework since a free trade agreement (FTA) typically doubles the bilateral trade between two member nations after ten years. However, we have seen the rise of trade policies that stifle free trade and encourage protectionist measures in the last three years. Such types of policies are mostly used by developed countries, such as the United Kingdom and the United States. The United Kingdom chose to leave the European Single Market, and the United States opted to withdraw its support for the Transatlantic Trade and Investment Partnership (TTIP) and threaten Mexico and Canada with a trade war under the North American Free Trade Agreement (NAFTA). Furthermore, the United States is also engaged in a true trade war with China. However, there is still great enthusiasm in the development of RTA creation, which has happened in various regions and has globally engaged most economies. For example, the European Union (EU) and Turkey continue to be the most active RTA negotiators in Europe; Asia's number of RTAs in force is led by Singapore, China, Japan, and South Korea; and Chile is the most active RTA negotiator in South America.

The welfare-enhancing implications of RTA creation for member nations have long been investigated. The removal of trade barriers enables consumers and producers to profit from the cheapest and most competitive supply sources based on the conventional advantage trade's theory (Ricardo, 1817; Samuelson, 1939). An RTA is expected to yield advantages from trade, enhance efficiency, and boost members' welfare since member nations reduce trade obstacles among themselves. RTAs members must benefit from trade agreements at the

expense of non-members (Haberler, 1936). However, Viner (1950) was the first to examine the impacts of RTA development and to question the traditional theory. He discussed the two major effects of trade creation and trade diversion and stated that an RTA does not always improve the welfare of member countries. According to Viner, RTAs are more likely to result in trade creation if high-cost domestic items may be substituted with lower-cost imports from a partner country. In this situation, RTAs promote the welfare of member nations by increasing efficiency in both production and consumption. On the other hand, regional trade agreements may result in trade diversion when imports of low-cost items move from low-cost manufacturers to higher-cost manufacturers (inefficient suppliers) because of the RTA's formation. This condition leads to inefficiencies in global manufacturing, which is bad for consumer surplus in member countries and external manufacturers of RTAs. Trade diversion is likely to result in welfare losses, not just for the rest of the world but also for the member states. According to Viner (1950), the net impact of trade liberalization arising from the creation of RTAs is equivocal and depends on the relative strength of trade creation and trade diversion effects. In his words, *"where the trade-creating force is predominant, one of the members at least must benefit, both may benefit, the two combined must have a net benefit, and the world at large benefits; but the outside world loses at least in the short run. Where the trade-diverting effect is predominant, one of the member countries is bound to be injured, both may be injured, the two combined will suffer a net injury, and there will be an injury to the outside world and to the world at large."* Later theoretical researchers sought to clear up the uncertainty around Viner's conclusions on the static impacts of trade agreements. An RTA is likely to cause a welfare-enhancing effect for member countries if exterior tariffs are managed after forming the RTA to keep international trade with non-members (Kemp and Wan, 1976; Meade, 1955). Similarly, Wonnacott and Lutz (1989) and Krugman (1991) suggest that RTAs may boost trade creation and raise welfare benefits based on the "natural trading partner" idea.

Trade creation and trade diversion impacts resulting from the development of RTAs are also widely studied empirically. The gravity model is used in the majority of research to examine these trade effects. These models improve the gravity equation's configuration to appropriately estimate variables that show whether RTAs member nations' trade within the region and with outsiders are above or below the anticipated levels. Most evaluations reveal evidence of extensive trade-increasing benefits of RTAs on intra-regional trade, with mixed RTA trade creation and trade diversion consequences on non-member's trade (Frankel, 1997; Soloaga and Winters, 2001; Carrère, 2006; Magee, 2008; Trotignon, 2010). These studies use

aggregate trade flows and assume the uniform effect of tariff elimination/reduction on the trade flows of different industries. In reality, however, the impact of tariff elimination or reduction could be different for different industries. Therefore these studies may be suffering from aggregation biasedness by using aggregate or semi-aggregate trade flows. Hence, there is a need for disaggregated analysis to examine the impact of tariff abolition on industries' trade flows to address aggregation biasedness. The disaggregate level analysis enables the researchers to know the trade effects of RTAs in detail.

The recent expansion in regionalization makes it essential to determine its effect on other macroeconomic variables. The interdependence among the economies is escalating, and the recession or boom in one country affects the rest of the region. As explained in the earlier section, the RTAs promote trade integration in the region and enhance the welfare effect of trade. If the RTAs promote trade integration in the region, it raises questions about how it affects the output growth of the trading partner. In particular, does the larger trade integration head economies toward synchronization of the business cycle?

The nexus between trade intensity and business cycle synchronization is subject to widespread research, encouraged in good part by the optimum currency area (OCA) literature that was developed by Mundell (1961) and given a new touch by Frankel and Rose (1998).⁸ The higher trade between two trading partners is projected to alter the business cycle pattern (Frankel and Rose, 1998). From a theoretical perspective, a higher trade intensity results in either a stronger or weaker co-movement of business cycles. The countries can specialize in the production of a particular commodity in which they have a comparative advantage because of closer international trade linkages. In such a case, the countries may be more vulnerable to industry-specific shocks, which lead to idiosyncratic business cycles. On the other hand, demand shocks promote business cycle synchronization if intra-industry trade is dominant. In the latter case, the higher trade intensity between bilateral trading partners promotes the co-movement of the business cycle.

As the closer trade link stimulates business cycle synchronization, it opens a way for countries to join a monetary union since they now fulfill Optimum Currency Area (OCA) criteria (Frankel and Rose, 1998). According to Frankel and Rose (1998), forming or joining

⁸ Mundell (196) present the theory of Optimum currency Area (OCA) theory and set certain criteria before joining a monetary union. He focuses on labor mobility, price flexibility, financial integration, and symmetric shock. On the other hand, Frankel and Rose (1998) present the endogenous theory of OCA and Frankel and Rose (1998) postulates that country can increase trade intensity and promote their business cycle synchronization once they make a union. So, if a country does not fulfil criterion ex-ante, it may fulfil ex-post.

of a currency union decreases the chances of asymmetric shocks among the members' countries and reduces the need for country-specific and sovereign monetary policy. The formation of monetary union decreases transaction costs, removes exchange rate fluctuations, eliminates market segmentation, and introduces price competition. In other words, the monetary union encourages bilateral trade, financial and economic integration, and build-up knowledge (De Grauwe and Mongelli, 2005).

After the presentation of endogenous theory by Frankel and Rose (1998), several studies try to empirically investigate the impact of trade intensity on business cycle synchronization and find a positive nexus between these two variables (e.g., Shin and Wang, 2003; Inklaar et al. 2008; Eggoh and Belhadj, 2015). However, these mentioned studies use gross trade data to compute trade intensity, which may not be appropriate. These types of studies may contain misleading results as the gross trade may be overvalued. The gross trade data gives a distorted picture as the trade of intermediate goods accounts for two-thirds of total trade (Johnson and Noguera, 2012). Due to the global supply chain, the product crosses borders several times in the form of intermediate products in the production process.⁹The trade data may overstate exports' domestic content due to double-counting because gross trade measures trade statistics at each border instead of the net value-added (Duval et al., 2016). A multi-country production function may exist apart from double counting, and the intermediate goods may take an indirect route to reach their final destination. The use of gross trade data in computing trade intensity may lead to biased and misleading results. Therefore, it is necessary to measure the trade intensity using the value-added trade, which gives accurate results.

As explained earlier, the welfare effect of trade increases by eliminating trade barriers. The member countries also get access to a wider market and can sell more goods because of free trade. However, the RTA formation also creates competition for the domestic industry because the countries cannot further protect their inefficient industries through tariffs or other protective measures. The pressure gets harder if the inefficient and low competitive industry absorbs a substantial labor force. It raises the question of how a country can increase the competitiveness of an inefficient industry and protect the labor force from being unemployed. The international competitiveness of an economy and its expansion have been given a role in policy for decades.

⁹ In supply chain, each manufacturer buys a product (raw material etc) and then contribute to its value. The value added is the price paid to the factor of production in each exporting country.

Global competitiveness is described as a country's ability to rationally use resources according to global specialization and trade in such a manner that improves the domestic product and living standard (growth should be based on a factual foundation but not on foreign indebtedness). Theoretically, the perception of competitiveness is generally connected to the comparative advantage theory, from initial to current. The policymakers consider the exchange rate and relative prices as important factors in determining a country's trade flows. It is a point of interest for them to know the role of the exchange rate and relative prices in adjusting the shock in trade flows. For example, suppose the exports of a country decrease because of low demand in the global market. In that case, the country seeks an effective policy between exchange rate depreciation and a decrease in relative prices through subsidies and tariffs. These two policies, decrease in relative price and exchange rate depreciation, are important and recommended options to be competitive in such conditions and to correct the trade balance problem. In this regard, Orcutt (1950) believes that trade flows respond faster to changes in exchange rate than to the changes in relative prices. If trade flows react faster to exchange rate than to relative price, i.e., the Orcutt hypothesis holds, the exchange rate depreciation policy suits a country more than a commercial policy to be competitive. Furthermore, the exchange rate depreciation also helps in adjusting the current account deficit of a country. The exchange rate depreciation caused by a positive monetary shock creates a consumption-shifting effect, switching global demand away from externally produced goods to domestically produced goods. More precisely, it makes exports cheaper and increases the price of imported goods, making a country's exports more competitive.¹⁰

Main objectives of the thesis

The general objective of the thesis is to analyze certain macroeconomic aspects of trade integration. The empirical discrepancies raised in the earlier research studies move us to the key objectives of our thesis. We address all these objectives in our different chapters.

The first specific objective of our thesis is to examine the trade creation and diversion effect of regional trade agreements. Instead of measuring trade effects at the aggregate level, we use disaggregated trade flows. In the analysis, our objective is to analyse the trade creation

¹⁰ Exchange rate depreciation also affect the business cycle synchronization. As the depreciation of domestic currency shift the global expenditure from foreign goods to domestic goods, it increases domestic production and decreases abroad. Therefore, we can say that it will create negative business cycle synchronization across countries. However, if the pass-through effect of currency depreciation is weak, the reverse may occur and can increase the business cycle synchronization.

and diversion effects of RTAs for all industries, as the tariff elimination/reduction response can differ for different industries. The second specific objective is to analyze the nexus between trade intensity and business cycle synchronization. Apart from this, we also investigate whether fiscal and monetary policy coordination promotes business cycle synchronization or not. The third specific objective of our thesis is to explore the best policy between exchange rate depreciation and relative price reduction to be competitive in the international market. For this purpose, we analyze the Orcutt hypothesis, which examines the response of trade flow to changes in the exchange rate and relative prices.

Methodological approach and analysis tools

This thesis is divided into three chapters to address all these objectives and questions. The general structure adopted in each chapter of this thesis consists in presenting a brief literature review that allows us to identify the main axes around which the discussions on the subject are structured, the methodology used in the chapter, and the results obtained.

The first chapter focus on the trade effects of regional trade agreements. More precisely, We focus on trade creation, trade diversion, and the net effect of different RTAs. The previous studies rely on aggregate trade data and assume a uniform impact of RTAs formation on the trade of different industries. As explained in the introductory section, tariff elimination/reduction's effect may differ for different industries. Only a few studies explore the effects of RTAs at the disaggregated level. However, all these studies do analysis for some specific product group. In our study, we analyse the trade effects of RTAs at the disaggregated level and explore the trade creation and diversion effect for all the industries

Two other deficiencies are also not addressed in most of the literature. These issues are zero-trade flows and endogeneity (country-pair heterogeneity) between trading partners.¹¹ To deal with these issues, we use the fixed effect Poisson Pseudo-Maximum Likelihood (PPML) estimator that estimates the model in multiplicative form and has several advantages.¹²

¹¹ The zero-trade may arise because of a few reasons. First, zero-trade occurs if there is no actual trade between two countries. This may arise because of large variable and fixed costs between two countries. Second, zero trade flows may be the outcome of rounding errors. If the trade flows are measured in thousands of dollars, the trade value may be recorded as zero if it is less than a certain threshold level. In particular, zero-trade values may frequently occur when we use disaggregated trade data. Third, the zeros may arise because of missing information that is wrongly registered as zero (Silva and Tenreyro, 2006).

¹² The use of the PPML estimator has several advantages. First, it deals with the zero trade flows by estimating the model in multiplicative form. Second, it is inappropriate to take the dependent variable's logarithm in the presence of the heteroscedasticity because the result may lead to an ambiguous conclusion (Silva and Tenreyro, 2006). The PPML estimator efficiently treats the heteroscedastic data through its built-in robustness feature. Third, we can interpret its results as elasticity according to its semi-log model specification (Urata and Okabe, 2014).

Based on its several advantages over others, we use fixed effect PPML to the gravity equation and use the panel data of fifty-five countries over the period of 2000-2018 to capture the trade effects of the EU, NAFTA, and ASEAN.

After assessing the trade effects of regional trade agreements, we move to *chapter two* and focus on our second objective. The second chapter explores the nexus of business cycle synchronization with trade intensity and policy coordination. Unlike the previous studies that measure trade intensity in the gross term, we use value-added trade data to compute the variable more accurately.¹³ However, to compare our results with the previous studies, we measure the trade intensity in gross terms and explore its relationship with business cycle synchronization in our first step. In our second step, we replace this trade intensity (gross) with the newly calculated variable of trade intensity (in value-added terms) to address the problem in measurement. Apart from the nexus between trade intensity and business cycle synchronization in East Asia, we also see the impact of policy coordination and exchange rate volatility on business cycle synchronization. We use panel data of ten East Asia countries and apply the fixed effects to see whether the region fulfils the ex-post criterion of OCA.

We address our third objective in *the third chapter* and analyze the Orcutt hypothesis in East Asia. Two types of methods are used to analyze the Orcutt hypothesis in the literature. The first method examines the Orcutt hypothesis by imposing the lag structure on the nominal exchange rate and relative prices. The acceptance or rejection of the Orcutt hypothesis depends on the lag structure imposed on each variable. The Orcutt hypothesis is accepted in this process if the nominal exchange rate takes fewer lags than relative prices. The second method uses the impulse response function to assess the Orcutt hypothesis by analyzing export and import flows' impulse response to variations in the exchange rate and relative prices. The Orcutt hypothesis holds if the exchange rate shows a quicker response to trade flows as compared to relative price variation. In other words, the emphasis is to analyze the time lag length of each trade flow to the exchange rate and relative price shocks. We use the time series data of eight East Asia countries over the period 1990-2020 and apply the Auto-Regressive Distributed Lag (ARDL) bounds testing approach to examine the Orcutt hypothesis, which has certain advantages over the other techniques.¹⁴ We get the short-run results from the first part of the

¹³ In recent eras, products cross the borders several times because of the increasing importance of the supply chain. In such a case, the gross trade data may reflect an overvalued term due to the double counting. Moreover, it is the value-added exports that contribute to the Gross Domestic Product (GDP) of a country rather than gross exports.

¹⁴ The major benefit of employing the ARDL approach is that it can be applied irrespective of having I(0) and I(1). Pesaran et al. (2001) propose two new critical values for the F test (i.e., I(0) and I(1)) to examine cointegration. They propose the upper bound I(1) value of F test assuming all the variables are integrated of order

ARDL equation (i.e., the variables in difference forms) and get long-run results from the lagged variables. For this purpose, we use Akaike Info Criterion (AIC) to select the optimum model in ARDL's first step. We compare the short-run results of exchange rate and relative prices to assess the Orcutt hypothesis. Furthermore, we also use the impulse response function (IRF) to analyze the Orcutt hypothesis and get a robust result. We derive the impulse response function by applying the Vector Auto-regressive (VAR) analysis and use Akaike Info Criterion (AIC) to select the optimum lag for VAR analysis.

Structure of the thesis

Taking into account the above-mentioned objectives, the thesis is divided into three chapters. The *first chapter* discusses and analyzes the first objective of our thesis. In this chapter, we present the history of the General Agreement on Tariffs and Trade (GATT), established in 1947 to eliminate trade barriers and promote international trade. We discuss the different rounds of negotiations under GATT and the establishment of the World Trade Organization (WTO). We also consider different kinds of regional trade agreements and their possible effects. In these trade effects, we focus on trade creation, trade diversion, and net trade effects that arise from forming a regional trade agreement. Our specific emphasis is to understand why these trade effects occur. Why do some RTAs result in trade creation and some in the diversion of trade? The third section of chapter one presents empirical studies focussing on trade creation and trade diversion. The empirical studies are divided into two groups, i.e., aggregate level studies and disaggregate level studies. This enables us to know the key theoretical connections and empirical shortcomings of the former studies. Our analysis explores the trade effect of RTAs at the disaggregated level and enables us to know the trade creation and diversion effect for all industries. The fourth section of the first chapter explains the methodology that we use to assess the trade creation and diversion effect of the selected RTAs. This section explains the model derivation, the econometric problems, and the reasons for using the PPML estimator. The results are given in section five. Using the aggregate trade data, we find the regional trade agreements results in trade creation and increase the welfare effect of trade. To study the trade impacts of these RTAs in detail, we do a disaggregated analysis. The industry-level analyses confirm trade creation in 60% of the EU's industries, 80% of NAFTA's industries, whereas trade creation is found in all ASEAN's industries.

one, and a lower bound value $I(0)$ considering all variables are integrated of order zero. The variables are supposed to be cointegrated (i.e., long-run relationship) if the value of the F stat is greater than the upper bound value.

Furthermore, the study also finds a significant impact of the other gravity variables on the trade flows. The GDP and population of both countries significantly determine their bilateral trade. The distance, proxied for the trade cost, possesses a negative sign and significantly affects the aggregate and the disaggregated trade flows.

After assessing the trade effects of regional trade agreements, we move to *chapter two* and focus on our second objective. The second chapter explores the nexus of business cycle synchronization with trade intensity and policy coordination. Furthermore, this chapter also discusses different Optimum Currency Area (OCA) criteria and sees whether East Asia fulfils these or not.

In chapter two's first and second parts, we present theoretical connections of business cycle synchronization with different variables and explain the theoretical background of the (OCA) theory. These variables include trade intensity, intra-industry trade, fiscal and monetary policy coordination, and exchange rate volatility. The OCA theory suggests several criteria for a potential candidate before joining a monetary union. These criteria include labor mobility, price and wage flexibility, business cycle synchronization, bilateral trade intensity, fiscal integration, and production structure (Mundell, 1961; MacKinnon, 1963; Kenen, 1969). The traditional theory suggests that an area should be optimal before joining a monetary union and a fixed exchange rate regime. However, Mundell (1973a, 1973b) reverses his own given pre-requisite of traditional theory since he believes that adopting the fixed exchange rate and forming a monetary union introduces optimality in an economic area. Frankel and Rose (1998) use the perception of Mundell (1973) and present the endogenous theory of the Optimum Currency Area. According to them, monetary union formation decreases transaction costs, removes exchange rate fluctuations, eliminates market segmentation, and introduces price competition. Moreover, they believe that if a country does not satisfy the OCA criteria ex-ante, it may ex-post. The endogenous theory of optimum currency area describes that the formation/joining of a currency union decreases the chances of asymmetric shocks among the member countries and reduces the need for country-specific and sovereign monetary policy.

The second part of section two presents the empirical literature review. This allows us to understand the theoretical base and discrepancies in the previous studies. The literature focuses on the work of Frankel and Rose (1998) and explores the nexus between trade intensity and business cycle synchronization. However, the literature studies suffer from a common problem as they use gross trade instead of value-added trade data. In present eras, products cross borders several times because of the increasing importance of the supply chain. In such a case, the gross trade data may reflect an overvalued term due to double counting. Moreover,

value-added exports contribute to a country's Gross Domestic Product (GDP) rather than gross exports.

Section three of chapter two presents the variable constructions, data, and methodology. We calculate trade intensity in several ways and see whether the results are sensitive to the calculation method. In order to compare our results with the previous studies, we measure the trade intensity in gross terms and explore its relationship with business cycle synchronization in our first step. In our second step, we replace this trade intensity (gross) with the newly calculated variable of trade intensity in value-added to address the problem in measurement. Apart from the nexus between trade intensity and business cycle synchronization in East Asia, we also see the impact of policy coordination and exchange rate volatility on business cycle synchronization. Using country-pair and year-fixed effect, we find that value-added trade intensity is the main driver of business cycle synchronization in the East Asia region rather than gross trade intensity. Similarly, East Asia's monetary and fiscal policy coordination also promotes its business cycle synchronization. The results of chapter two are given in section four. The results show a significant and sizeable effect of value-added trade intensity on business cycle synchronization in the region. This result is because of the growing supply chain in East Asia and ASEAN. This also indicates that value-added trade is causing co-movements in the business cycle rather than gross trade. Our results also show the importance of intra-industry trade, which is also a key determinant that drives the region's business cycle harmonization. After the inclusion of other control variables, the results remain the same. The exchange rate volatility, financial integration and policy coordination are also essential in promoting business cycle synchronization in the region.

In our third chapter, we address our third objective and analyze the Orcutt hypothesis in East Asia. Orcutt (1950) believes that trade flows respond faster to exchange rate changes than relative prices. In the first part of this chapter, we explain the theoretical foundation of the Orcutt (1950) hypothesis. We describe different lags that contribute to the Orcutt hypothesis and explain why trade flows react faster to the variation in exchange rate than to the relative prices in the first section. The second section of this chapter presents the empirical studies that enable us to find a research gap. The third section of chapter three presents the methodology. Two types of methods are used to analyze the Orcutt hypothesis. The first method analyses the Orcutt hypothesis by imposing the lag structure on the nominal exchange rate and relative prices. The acceptance or rejection of the Orcutt hypothesis depends on the lag structure imposed on each variable. The Orcutt hypothesis is accepted in this process if the nominal exchange rate takes shorter lags than relative prices. The second method uses the impulse

response function to assess the Orcutt hypothesis by analyzing export and import flows' impulse response to variations in the exchange rate and relative prices. The Orcutt hypothesis holds if the exchange rate shows a quicker response to trade flows as compared to relative price variation. In other words, the emphasis is to analyze the time lag length of each trade flow to the exchange rate and relative price shocks. Our analysis uses the Auto-Regressive Distributed Lag (ARDL) bounds testing approach to examine the Orcutt hypothesis, which has certain advantages over the other techniques. We present the results of the estimated model in section four. For this purpose, we use Akaike Info Criterion (AIC) to select the optimum model in ARDL's first step. We compare the short-run results of exchange rate and relative prices to assess the Orcutt hypothesis. The study results reveal that exports of five countries respond faster to the changes in exchange rate than to the relative price and support the Orcutt hypothesis¹⁵. Similarly, the estimation of the import equation also supports the Orcutt hypothesis in five countries¹⁶. In short, our results indicate that the Orcutt hypothesis is supported in general, and trade flows react faster to changes in the exchange rate than relative prices.

¹⁵ We do our analysis for eight East Asia countries. Out of these eight countries, the Orcutt hypothesis is supported in five countries. These countries are Hong Kong, Korea, Malaysia, Thailand, and Singapore.

¹⁶ The countries whose imports respond faster to the exchange rate than to the relative price are Hong Kong, Korea, Malaysia, Thailand, and China.

Chapter 1

Trade effects of regional trade agreements: Trade creation and trade Diversion at the industry-level

1. Introduction

International trade plays a crucial part in the development of a country. The ability of a country to trade reflects the growth of the economy and the increased productivity level. As David Ricardo explains in his theory of comparative advantage, a country can increase its income and consumption level by engaging itself in trade. A country gets the such type of advantages through economies of scale, technological innovation and enhancement of consumption.

In order to increase bilateral trade and the welfare impact of trade, twenty-three countries of the world signed the General Agreement on Tariff and Trade (GATT) in 1948 and decided to remove the barriers to trade, such as quotas and tariffs that curtail trade. The GATT signing increased trade liberalization based on mutual interest and reduced the tariff rate due to the multilateral negotiation. The tariff rate was reduced by 35% in Kennedy and one-third in the Tokyo Round.¹⁷ The Uruguay round took place in 1994, considered the most productive in the history of GATT, and the average tariff rate was reduced by 39 %. After the transition of GATT into the WTO in 1995, the number of regional trade agreements rapidly increased. The intensity of regionalism can be identified as the number of RTAs in force increased to 350 in 2021, which was only 22 in 1990¹⁸. In the given RTAs, 10% are customs Unions (CU), and 90 % are Free trade agreements. According to Clarete et al. (2003), most of the trade takes place among the countries that belong to these agreements, as 97% of trade was recorded among the countries that have signed at least one RTA.

The curiosity to quantify the influence of regional trade agreements (RTAs) on member countries' trade and the rest of the world increased with the RTAs numbers (Bhagwati and

¹⁷ The Kennedy round (1964-1967) was a sixth session of GATT held at Geneva, and 62 countries took place. Whereas the Tokyo round held from 1973 to 1979, and 102 countries of the world participated in that round.

¹⁸ <http://rtais.wto.org/UI/PublicMaintainRTAHome.aspx>

Krueger, 1995). According to Bhagwati and Krueger (1995), the country's engagement in regional trade agreements (RTAs) alters not only the trade of that country but also affects the rest of the world's trade. Due to the influence of RTAs on trade flows, many studies attempt to capture the impact of RTAs on trade flows by concentrating on trade diversion and the trade creation effects. In the literature, two types of approaches (ex-ante and ex-post) are used to measure the influence of different trade strategies on exports and imports. The ex-ante analysis uses the CGE model, whereas the ex-post analysis uses the regression technique. Several studies use the ex-post approach due to its feasibility and property of accuracy with which it defines the size of bilateral trade flows. In ex-post analyses, the researchers use the gravity model of trade, which positively connects the trade flows with the economic size and negatively with the bilateral distance. The gravity model's use is advantageous as the specific dummy variable can be included to measure trade creation and trade diversion. Frankel (1998), Baier and Bergstrand (2002), and Ndrianasy (2017) employ the gravity model to compute the impact of RTAs on trade flows of countries as well as on the regions. However, these studies may suffer from aggregation bias as they use aggregate or semi-aggregate trade flows and assume the uniform impact of tariff elimination/reduction on different product trade flows. In order to address this issue, there is a need for disaggregated level analyses to observe the impact of RTAs and tariff reduction on the product's trade (Urata and Okabe, 2014). A few studies use disaggregated trade data to tackle the issue of aggregation biasedness. However, these studies explore the nexus for specific commodity trade flows and don't present a comprehensive analysis of all the products.

Our study contributes to the existing literature in several ways. First, we disaggregate the trade data by products to analyze the impact of RTAs on the commodity trade flows. For this purpose, we employ the 1-digit industry's trade data to evaluate the influence of RTAs on all the 1-digit industries' trade flows by focusing on the creation and diversion of the trade.¹⁹ Second, we also employ the aggregate trade flows data and examine the trade effect of RTAs for comparison. The aggregate exports examination, accompanied by the disaggregated analysis, enables us to understand the trade effects in detail.²⁰ Apart from the aggregation bias,

¹⁹ We measure the trade creation and trade diversion effect of three major RTAs, i.e., EU, NAFTA, and ASEAN. We don't consider those countries of EU that has joined the EU after 2004. Similarly, we consider Indonesia, Malaysia, Philippines, Singapore, Thailand, and Vietnam as ASEAN's members and exclude the rest of the country due to non-availability of data.

²⁰ We use aggregate exports flows in order to compare the finding with the previous studies, and to know the trade effects of RTAs at aggregated and disaggregated level.

two other issues are missing in most parts of the literature and need to be addressed. These issues are endogeneity (the unobserved heterogeneity of country pairs) and the issue of zero trade flows. The endogeneity could arise because of ignoring the correlation between the formation of an RTA and the unobservable factors that conclude in the error term. Therefore, one should know the elements for the formation of the RTA, such as the chances of welfare gain, the relative factor endowments, the distance and the GDP size, to tackle the unobserved heterogeneity (Baier and Bergstrand, 2004). We address this issue through the country-pair fixed effect. On the other hand, the problem of zero-trade occurs when there is no actual trade or the value is less than the threshold level. The problem of zero-trade is common in trade data, particularly in disaggregated data. The previous studies either completely delete the zero trade flows or replace the zeros with an arbitrary small number. However, these methods are arbitrary and have no theoretical justification, leading to bias and inconsistent results (Linders and Groot, 2006). The log-linearize method may lead to several problems in estimating the gravity equation. For example, if $y=0$, then $\ln(y)=\infty$ and OLS will not be feasible. In such a case, the problem can be solved by using the Poisson Pseudo Maximum Likelihood (PPML) estimator by estimating the gravity equation in the multiplicative form (Silva and Tenreyro, 2006). Hence, we use a fixed effect Poisson Pseudo Maximum Likelihood (PPML) estimator to address the problem of endogeneity and zero trade flows.²¹

Apart from this introductory unit, the chapter is arranged as follows. We present the history, types, and trade effects of regional trade agreements (RTAs) in section 2. Section three of this chapter presents a brief survey of the literature related to trade creation and diversion. The theoretical foundation and development of the gravity equation, the econometric issues, and econometric techniques are discussed in section four. Section five contains the data and its description, whereas the results of our estimated model are given in section six. In the last, the study's conclusion is presented in section seven.

²¹ The PPML picks the zero values assuming that these are missing as a result of rounding error. For more details, see the methodology section.

2. Regional trade agreements (RTAs), types, and trade effects

This section is divided into two different sub-sections. In the first part of this section, we explain the history and different types of regional trade agreements (RTAs). In the second part of this section, we explain the trade effects resulting from the creation of regional trade agreements.

2.1. Overview

After World War II, economic pressure pushed countries to impose trade barriers, boost the consumption of domestically produced goods, and divert national demand away from imports. Due to the recession and financial crises, international trade collapsed due to a lack of confidence in each other, resulting in many economic issues. In order to overcome such problems, a conference was organized at Bretton in 1944. Several countries participated in the conference and agreed on forming three crucial organizations, i.e., the International Monetary Organization (IMF), the World Bank, and the International Trade Organization (ITO).

The International Trade Organization establishment faced resistance from the USA and several other countries. However, an agreement was signed by 23 countries on 30th October 1947 in Geneva, Switzerland. That agreement is called General Agreement on Trade and Tariff (GATT). It came into existence on 1st January 1948. The main goal was to promote international trade and eliminate trade-related barriers to bring economic prosperity. The GATT converse into World Trade Organization (WTO) in 1995, and the world experienced an expeditious growth in the number of regional trade agreements. Being an international organization, the WTO deals with the global rules of trade and ensures trade between nations. It provides a platform that allows members to participate and resolve trade issues with each other for member countries. The world trade organization is a forum that deals with trade agreements, resolves trade disputes and trade barriers, and operates the trade rules by jointly agreed procedures of the member nations. The world trade organization aims to grow imports and exports globally and eliminate barriers and hurdles faced by member countries.

The WTO agreements are the result of negotiation between the members. The WTO oversees agreements in about 60 different sectors which have international status. The sectors include agriculture, textile and clothing, banking, telecommunications, public procurement, industrial standards, product safety, agreement on customs valuation, agreements on technical barriers to trade, treaties on the usage of sanitary and general pacts on trade and services, etc.

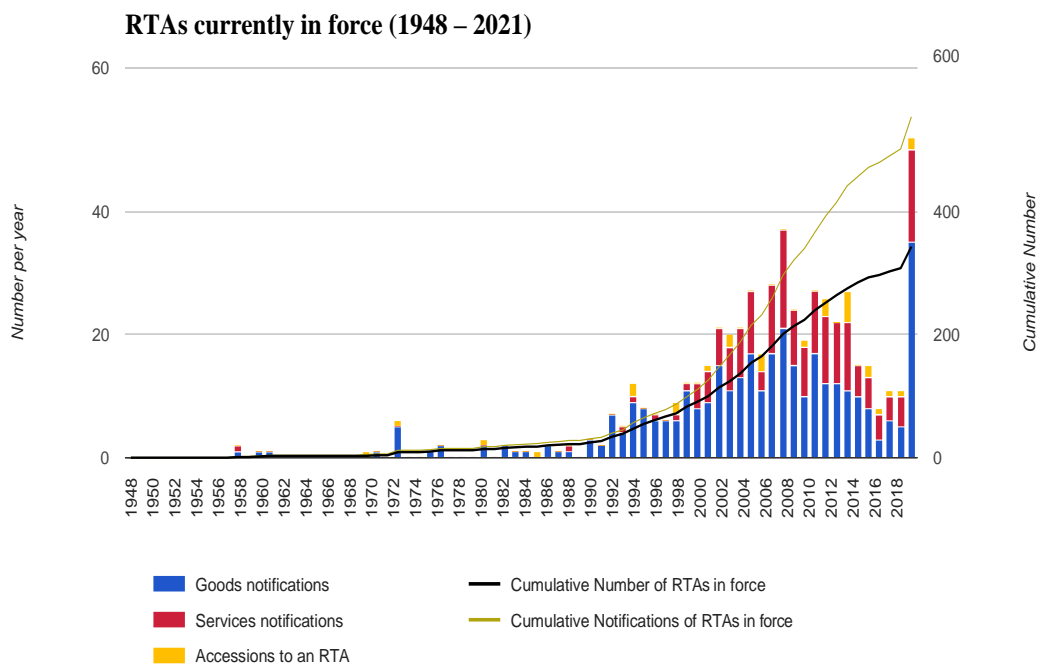
Table 1.1: GATT and WTO rounds/conferences

Years	Place	Agenda	Year	Place	Agenda
1947	Geneva, Switzerland	Formation of GATT	1999	Seattle, US.	Overview existing agreements and agriculture trade
1949	Annecy, France	Removal of Trade barriers	2001	Doha, Qatar	Negotiation on lowering Trade barriers and rules
1951	Torquay, UK	Trade Integration	2003	Cancun, Mexico	Progress in negotiation and work on Doha development agenda
1956	Geneva, Switzerland	Trade Integration	2005	Hong Kong, China	Political direction for the organization and trade integration
1960-61	Geneva, Switzerland	Trade Integration	2009	Geneva, Switzerland	The WTO, the Multilateral Trading System
1964-67	Geneva, Switzerland	Tariffs Dumping	2011	Geneva, Switzerland	Significance of the WTO, Multilateral Trading System and the Trade Development" and "Doha Development Agenda
1973-79	Geneva, Switzerland	Framework	2013	Bali, Indonesia	Streamlining trade
1986-94	Geneva, Switzerland	Creation of WTO	2015	Nairobi, Kenya	Promoting agriculture and international trade
1996	Singapore	Trade Agreements	2017	Buenos Aires, Argentina	Negotiation in all areas, such as providing subsidies on fisheries etc.
1998	Geneva, Switzerland	Overview of the WTO activities	2020	Nor Sultan, Kazakhstan	Postponed due to covid-19 pandemic

Since 1930, substantial growth has been recorded in regional integration globally. According to the World Trade Organization (WTO) report, the notified regional trade agreements surpass 500 figures, and 350 are in force.²² Regional trade agreements (RTAs) represent an agreement that is endorsed by two or more states to promote and integrate the free flow of goods and services among its member states.

²² See figure 1.1.

Figure 1.1: Regional trade agreements 1948-2021



Source: WTO website

The world witnessed substantial growth in regional and bilateral trade agreements in the last two decades. However, this evaluation of trade effects resulting from establishing regional trade agreements is always followed by the concept of trade creation and diversion, which Viner first introduced in 1950. Trade creation means an increase in economic welfare and trade creation between two or more countries by eliminating the existing barriers in trade. On the other hand, trade diversion occurs when trade in terms of exports is diverted from one efficient country to a less efficient country because of free trade agreements. These agreements among countries create trade blocs. In the trade bloc, states decide to cut or eradicate trade obstacles among trading partners. Whenever some countries meet and decide to abolish trade barriers such as import quotas, preferences for most (if not all), and tariffs on goods and services between them, they create a trade agreement. The free trade area's objective is to ease obstacles to trade so that trade flows can be developed through specialization, division of resources and, above all, comparative advantages. Regional trade agreements can be unilateral trade agreements, bilateral agreements in nature, or multilateral trade agreements. For example, the Canada-United States free trade accord was endorsed in 1988. A free trade agreement involves reducing or completely abolishing trade barriers, such as tariffs, quotas, etc. This agreement allows for the free drive of commodities and, in more advanced international trade

treaties, the lessening of limits on investment and institutions, letting the free drive of capital and free provision of services.

Regional trade agreements offer several benefits to their members, such as boosting economic growth in the shape of creating more employment opportunities, reducing the rate of unemployment, market expansion, and foreign direct investment. RTAs make a trading environment for their members, ultimately increasing regional trade volume. These regional trade agreements produce several opportunities for businesses because of the access to the new market.

The regional trade agreements can be classified into five sub-sections based on the integration level. These are Preferential Trade Agreements (PTAs), Free Trade Agreements (FTAs), Custom Unions (CUs), Economic Unions (EUs), and Common Markets. We discuss each of these in the following sections.

2.1.1. Preferential trade area

The Preferential trade arrangements (PTAs), according to the World Trade Organization (WTO), are unilateral trade preferences and follow the Generalised System of Preferences (GSP) schemes. In these agreements, the high-income countries award preferential tariffs to imports from low-income countries), as well as other non-reciprocal preferential schemes granted a waiver by the general council. These types of agreements (i.e., PTAs) have become a keystone in the system of the international trade system. Increasing number and significance is rapidly reforming the design of the global trading system and the trade atmosphere of developing countries.

2.1.2. Free trade agreements (FTAs)

Free Trade Agreements (FTAs) are different from Preferential Trade Agreements (PTAs). In free trade agreements, all types of trade obstacles among member states are abolished. Once the agreement is signed, all the member states of the FTA can freely export and import without any restrictions. However, the FTA does not affect the trade policies of the member states with the non-member countries, and each country's trade policy is still effective.

A Free Trade Agreement (FTA) is an accord between two or a group of countries to lessen obstacles in bilateral trade. Under an FTA and free trade policy, goods and services can

be sold and bought across international boundaries with zero or little tariff, subsidy, quota, or prohibitions to inhibit their exchange.

2.1.3. Customs unions

A customs union (CU) is defined as a regional trade treaty whereby countries favorably allow tariff-free market access to trade among member countries and agree to adopt a common external tariff (CET) on imports from the rest of the world. This is considered one of the most sophisticated forms of the regional trade agreement (RTA) and usually involves substantial coordination among member countries. Once a country decides to join a Customs Union (CU), it allows it to renounce some of its state autonomy over creating and implementing trade policy. So, the member countries of customs unions remove trade obstacles among themselves and adopt common external trade obstacles for the non-member states.

However, it is crucial to keep in mind that although custom unions integrate trade within the union, it does not permit free labor movement and capital among member states. For example, Russia, Belarus, and Kazakhstan formed a customs union in 2010. They agreed to remove trade obstacles among themselves and decided on certain common strategies to deal with non-member states.

2.1.4. Economic union

Another type of regional trade agreement is Economic Union. It is a type of regional trade agreement in which member states eradicate trade obstacles among themselves and follow common external trade policy for the non-member states. It allows the free flow of goods and services, permits the free movement of resources such as capital and labor, follows a set of economic policies, and adopt a common currency for trading purpose.

European Union (EU) is the finest and most well-known example of an economic union. The EU member states use a single currency, adopt a single monetary policy, and make tariff-free trade within the region.

2.1.5. Common market

The common market is another type of regional trade agreement where union members eliminate internal trade obstacles, follow common trade policies for non-member states, and allow members to move goods and services across borders freely.

The creation of trade has a positive welfare effect as it shifts the origin of a product from high-cost producers to lower ones. Conversely, trade diversion refers to a welfare loss caused by a shift in product form from a lower-cost producer to a higher one. Trade creation and diversion can be explained more in Figures 1.2 and 1.3, respectively:

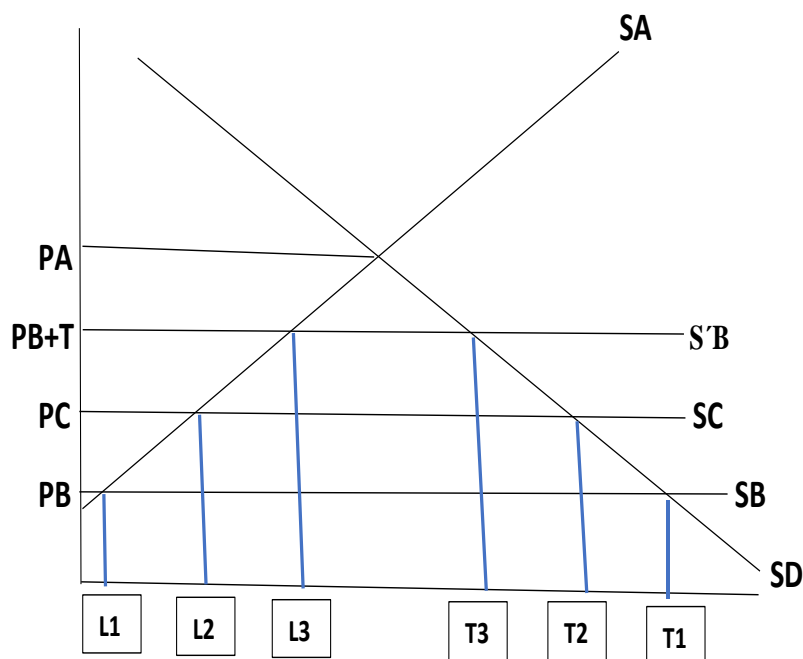
Figure 1.2 shows trade creation. Along \overline{OX} we measure the number of goods to be available for supply by local and external sources or the total goods to be consumed. Along \overline{OY} , we show the price of that particular good. "SA" shows the supply curve of country A while SB represents the Supply curve of country "B" from which the goods are being imported. Country "B" supplies at "PB" price before the tariff. The price of imported goods increases from PB to PB+T after the imposition of the tariff on imports. The local suppliers need to reduce their prices from P to PB+T to be in the market and sell their products. If they charge a price higher than PB+T, they will lose their customers. At this new price, L1 is the quantity of output supplied by the local producer, and T1 represents the total consumption. The yellow line represents the gap between the total supply and consumption. This gap can be covered through trade. So, the volume of goods imported from country B will be equal to the difference between T1 and L1.

Let A and B make an economic integration and remove all trade barriers in terms of tariffs between them. As a result, the price of imported commodities will reduce from PB+T to PB, and the total consumption will increase from T1 to T2. The local supplies are equal to L2 at this price, and the remaining consumption can be covered through imports from country B. As a result, importing goods from country B will increase and equal the difference between T2 – L2. So, here we see a massive increase in welfare gain because of trade creation or economic integration. We find a net positive effect by comparing consumer surplus, producer surplus, and a loss in government revenue. This positive net effect is called trade creation.

2.2.2. Trade diversion

The creation of a regional trade agreement affects the trade between member and non-member states. For example, if a non-member state has a comparative advantage in a particular product, the RTA members can manipulate its comparative advantage by imposing a tariff. This imposition of tariffs encourages and protects the inefficient producer at the cost of an efficient producer. This generates a welfare loss and reduces the volume of trade goods. This process of diverting trade from an efficient to an inefficient producer is generally known as trade diversion. The following diagram further explains in detail the diversion of trade.

Figure 1.3: Trade diversion



This figure shows trade diversion. Along with OX , we measure the volume of goods available for supply by local and external sources or total goods to be consumed. Along OY , the price of that particular good is shown. SA and DA represent country A's supply and demand curve, where PA is the price before the trade. Suppose A trades with B; SB and PB lines represent the supply and price of country B, respectively. In the absence of a regional trade agreement, $L1$ shows the local output of country A, while $T1$ represents the number of goods supplied by country B. Similarly, SC is the supply of country C, and PC is the price of goods supplied by country C to country A. From figure 1.3, we may conclude that country B has comparative advantages in producing this particular product compared to countries A and C because of its low price.

Let's suppose countries A and C join a regional trade agreement and impose a tariff on imports from non-members (i.e., country B). In such a case, the supply curve of country B shifts from SB to $S'B$ and the price increases from PB to $PB+T$. In this case, country A must purchase from country C instead of country B because of its higher price after the tariff.

Similarly, $L2$ is the local consumption, while $T2$ represents country C's supply of goods. After joining a regional trade agreement and imposing the tariff on imports from non-member states, country A imports from country C instead of country B. From Figure 1.3, we may conclude that the local output increased from $L1$ to $L2$ and total consumption reduced from $T2$ to $T1$

when country A trades with country C, representing that trade has been diverted from country B to C due to the imposition of tariff on B. So after the formation of a regional trade block, country A will trade with country C rather than B. This results in a loss of welfare gain and indicates a diversion of trade.

3. Literature review

The research and literature on regional trade agreements started in 1950 when Jacob Viner defined the welfare influence of trade that it depends on the creation and diversion of trade. The trade creation points out the condition when a country starts importing from an efficient member of the trade agreement instead of producing domestically. In contrast, trade diversion means that a country shifts its imports from a more competent country to a less competent one after joining the regional trade agreement.

In the 1960s, researchers paid much attention to capturing the effect of regional trade agreements on welfare because of European integration. However, the theoretical and empirical literature augmented in the eighties after the wave of regionalization. Tinbergen (1962) developed the gravity model's foundation in international economics using Newton's universal gravitational law explaining that the trade between the two countries is directly proportional to their GDP size and inversely proportional to the distance between these countries. However, the microeconomic foundation of a gravity model was developed by Anderson (1979) based on product differentiation, linear expenditure system, and homothetic preferences. In the following section, we present a brief literature review on the trade effects of regional trade agreements (RTAs). We divide the literature into two parts based on their approach, i.e., aggregate and disaggregated studies.

3.1. Aggregate level studies

Tinbergen (1962) measures the influence of regional trade agreements. He finds that the regional trade agreement positively and significantly affects British Commonwealth countries' trade but has an insignificant impact on Benelux FTA. Aitken (1973) criticizes the previous studies for isolating the impact of integration on trade from the changes in income and other determinants of international trade. He incorporates all the determinants of bilateral trade and applies the same method of Tinbergen (1962) to measure the welfare effect of the European Economic Community (EEC) and the European Free Trade Association (EFTA) on the trade of member states. He finds a positive and significant effect for both EEC and EFTA

and concludes that both experience growth over their integration period. Similarly, Brada and Mendez (1983) also find that both developed and developing countries can take benefit from the trade agreement.

In the 1990s, the world experienced a rapid expansion in Regional Trade Agreements and the literature on RTA was highly developed. Frankel, Stein and Wei (1995) employ the gravity model of trade to quantify the response of RTA on trade in NAFTA, AFTA, and the MERCOSUR. They observe a significant positive growth for AFTA and MERCOSUR but not in the case of NAFTA. Likewise, Frankel (1998) finds the trade creation in the case of Andean and ASEAN and trade diversion in the case of EFTA. Gould (1998) believes that the former studies on NAFTA focus on employment instead of trade. He uses the gravity model to capture the impact of NAFTA on trade flows. He obtains the significant effect of NAFTA on trade and finds a significant increase in the bilateral trade between the United States and Mexico.

Endoh (1999) criticizes the methodology of the prior studies for not distinguishing between trade creation and diversion. He includes separate variables to analyze the impact of trade creation and diversion in the European Economic Community (EEC), the Council of Mutual Economic Assistance (CMEA) and the Latin American Free Trade Association (LAFTA). He employs the interval of five years and finds a significant trade creation and diversion coefficient. Whereas, Soloaga and Wintersb (2001) modify the gravity model to capture the response of the trade to each preferential trade agreement. They find evidence of trade creation in the case of Latin American Countries, whereas trade diversion in EFTA.

Baier and Bergstrand (2002) criticize the previous studies for not considering the endogeneity. They believe that the trade policies are not exogenous as the RTA term can be correlated to the error term. They find striking empirical results when they allow for the endogeneity of RTA and show the quadrupled impact of the RTA variable on trade flows. To measure the impact of the regional trade agreement on Africa's trade, Musila (2005) finds greater trade creation in the Economic Community of West African States (ECOWAS) followed by the Common Market for Eastern and Southern Africa (COMESA). In contrast, he does not find trade creation in the Economic Community of Central African Countries (ECCAS). Following Baier and Bergstrand (2002), Carrere (2006) applies the same procedure to tackle the problem of endogeneity and employs the panel data of 130 countries to examine the impact of the regional trade agreement. She finds that the RTAs significantly increase the trade between the member states.

Martinez-Zarzoso et al. (2008) include the dynamic factors along with the static gravity model to measure the effect of the preferential trade agreement. Furthermore, they also control the multilateral resistance and tackle the endogeneity. They find higher trade creation in the EU and NAFTA than in developing countries. Similarly, Shinyekwa (2015) captures the trade creation and trade diversion effect for the East African Countries (EAC). He uses the static and dynamic random-effects model and finds that the EAC is more trade creating than trade diverting. Deme and Ndrianasy (2017) find that most of the studies measure the trade effect of RTAs in developed countries and ignore low-income countries. For this purpose, they measure the welfare effect of RTAs across low-income countries. They account for the heterogeneity and observe the trade creation effect in the ECOWAS countries.

3.2. Disaggregated level studies

The above-mentioned literature suffers from a common problem of aggregation biasedness as they employ the aggregate or semi-aggregate trade flow data and assume the uniform effect of trade policies across the commodities trade. However, the tariff elimination or reduction varies considerably across products, and the response to trade flows may be different for different commodities. The use of aggregate trade data does not capture the true impact of trade flows, and the results could be misleading. So, it is important to use product-level data to analyze the accurate impact of the regional trade agreement (RTA) on trade flows. To tackle this problem, Koo, Karemera and Taylor (1993) employ the gravity model of trade for a single commodity and investigate the determinant of meat trade using panel data. They find the significant impact of the trade agreement on the meat trade between the trading partners. Similarly, Dascal et al. (2002) analyze the factors that affect the EU trade flows of wine. They employ panel data for the first twelve EU members and use the one-way fixed-effect model to tackle the problem of country pair heterogeneity. They find evidence of trade creation among the EU member states in the wine trade. Cao and Johnson (2006) also use a gravity model to capture the factors that affect New Zealand's meat trade. They observe the income of the importing countries and the net prices as dominant factors. Urata and Okabe (2007) use the aggregate as well as disaggregate trade data with the assumption that the impact of FTAs is different for different products. They find the effect of trade creation at the aggregate level and find different patterns for different commodities. They tackle the issue of endogeneity but fail to address the problem of zero-trade flow. Jayasinghe and Sarker (2008) analyze the trade flows of six agri-food in NAFTA and find an increase in intra-region. Karemera et al.

(2009) also criticize the previous studies that employ aggregate trade flows data. They examine the impact of the FTA on the vegetable and fruit flows of the US and observe the greater trade creation effect in NAFTA and APEC than in the EU. Gauto (2012) includes the zero trade flows and uses the Heckman sample selection method to analyze the aggregated as well as the disaggregated trade flows of MERCOSUR. He observes that inter-regional imports have increased by 266% since 1995. Furthermore, he also finds great expansion in the trade flows of Animal, vegetable oils and fats, and Beverages and Tobacco. In another paper, Urata and Okabe (2014) criticize the previous studies for employing econometric techniques that do not properly address zero trade flows. They use the PPML estimator to tackle the zero trade flows and analyze the trade flows of selected products. For the EU, they find evidence of trade creation in the trade of agriculture products, whereas NAFTA and AFTA show the effect of trade creation in the trade of machinery. Karemera et al. (2015) employ the modified gravity model to identify the determinants of bovine and swine meat trade flows. They also evaluate the effect of the regional trade agreements on trade flows and find income, population, distance, exchange rate volatility and production capacity as the major factors of meat trade flows. Furthermore, they find evidence of trade creation in NAFTA, MERCOSUR, and the EU. On the other hand, they find trade diversion in the case of ASEAN countries. Okabe (2015) also investigates the impact of FTAs on the trade flows in East Asia and finds that the trade in industrial supplies, consumer, and capital goods significantly increases among the member countries. Karemera and Smalls (2017) analyze the vegetables and fruits trade flows and observe the trade creation in NAFTA and the EU.

From the above literature, we conclude that recent studies have paid attention and diverted their studies from aggregate to disaggregate levels. However, most of them have used a single commodity trade flows data and explored the impact of trade policies only for the specific industry. For example, Karemera *et al.* (1993, 2015) use the data of meat trade flows, Dascal *et al.* (2002) use wine trade, and Jayasinghe and Sarker (2008) employ only Agri-food product data. Similarly, Urata and Okabe (2014) just focus on manufactured goods and ignore other industries.

The literature indicates that there is no comprehensive study that gives a clear picture of trade policies on the trade of different products. We need to know the trade effects of regional trade agreements on all industries. In our study, we fill this gap and explore the trade effects of RTAs on all industries. In order to capture the response of regional trade agreements (RTAs) on the trade flows of different products, we use 1-digit data of all the industries and the panel

data of the 55 countries. We measure the trade effect of three RTAs, i.e., NAFTA, European Union, and ASEAN.²³ In our first step, we just focus on the aggregate trade flows and see the impact of regional trade agreements on trade. This enables us to compare our results with the studies that use aggregate trade flows. In our second step, we move to the disaggregated analysis and see the trade effect of these RTAs by focussing on trade creation and trade diversion.

The former studies focus on one of the trade flows, i.e., either export or import flows. In contrast, our study focuses on both of these trade flows and sees the impact of RTAs on the exports and imports of these countries. Instead of just concentrating on trade creation and trade diversion, we assess the net effect of these RTA. Furthermore, we assess not only the impact of trade policies on the export flows but also on the import flows of the selected region.²⁴

Besides this, there are two other problems relating to this topic, i.e., country-pair heterogeneity and zero trade flows. The recent literature has paid little attention to these problems.²⁵ In this study, we tackle the heterogeneity, as well as the problem of zero trade flows problem.

²³ The intuition to use 1-digit industry data is to analyse the trade flows of all the product. The other studies that use disaggregated data do their analysis for a specific products group. Hence, we use the SITC revision 3 and the data of all 1-digit industries. The use of 1-digit disaggregated data make it easy to analyse all the product group.

²⁴ In our analysis, we use three types of dummies to capture the trade effect, i.e. intra-region exports, region-members exports to non member, and non-member exports to the region. The third dummy reflect the import of the region and enable us to capture the RTAs effect on the imports of the region.

²⁵ This zero-trade problem arises when there is no actual trade between the pair of country or the trade value is less than the threshold level. In particular, the zero trade values may frequently occur when we use disaggregated trade data.

Table 1.2: Summary of literature review, focusing on trade creation and trade diversion

Authors	Year	Country/Region	Sector	Results
Frankel, Stein and Wei	1995	NAFTA, AFTA and MERCOSUR	Aggregate trade flows	Positive impact of RTA in case of AFTA and MERCOSUR, but not for NAFTA.
Frankel	1998	ASEAN, Andean and EFTA	Aggregate	Trade creation for ASEAN and Andean, whereas trade diversion for EFTA.
Soloaga and Wintersb	2001	58 countries	Aggregate	Trade creation for Latin American countries, but trade diversion for EFTA.
Caree	2003	130 countries	Aggregate	Find trade creation.
Eager	2004	EU and NAFTA	Aggregate	Find Trade creation in the long run.
Dascal et al.	2002	First 12 EU countries	Wine trade flows	Trade creation in the wine trade
Urata and Okabe	2007	EU, AFTA, NAFTA, MERCOSUR and few bilateral RTAs	Few selected Products	Trade diversion in case of EU, NAFTA and MERCOSUR, but trade creation in case of AFTA
Jayasing and Sarker	2008	NAFTA	Six agri-food products	Trade creation
Karemera et al.	2009	United States	Vegetable and fruit	Trade creation
Karemera et al.	2015	NAFTA, EU, ASEAN and MERCOSUR	Bovine and Swine meat flows	Trade creation for NAFTA, EU and MERCOSUR, but find trade diversion in ASEAN's trade.
Deme and Ndriansay	2017	Low income countries	Aggregate	Trade creation in the ECOWAS countries.

EFTA stands for European free trade area, and MERCOSUR is a south American trade block. Similarly, ASEAN is the association of south-east Asian nations, whereas NAFTA is the trade agreement among United States, Canada and Mexico.

4. Model and methodology

This section presents the methodology, the data, and the estimation approach to analyze our objectives. First, we assume monopolistic competition and derive a gravity equation for the commodity trade flows. Second, we discuss several econometric issues related to the estimation of the gravity equation. We discuss the possible endogeneity, the problem of zero-trade flows, and the estimation specification in this section. Third, we present the data sources and the descriptive statistics of the variables. We also present the export values, export shares, and annual average growth rate of all the 1-digit industry trade flows in the selected regions.

4.1. Historical background

Tinbergen (1962) develops the theory of gravity model in international trade using Newton's universal gravitational law. He believes that the trade between the two economies is directly proportional to their GDP size, whereas inversely proportional to the distance between them. Similarly, Anderson (1979) provides a microeconomic foundation of the gravity model using the linear expenditure system and assuming the country's homothetic preferences. However, Bergstrand (1985, 1989) provides a solid theoretical base for the gravity model. He includes the price variable in his model and calls it a generalized gravity model. The gravity model is commonly regarded as the reduced form equation of the general equilibrium of demand and supply model (Anderson, 1979; Bergstrand, 1985, 1989; Anderson and van Wincoop, 2003). In the recent literature, most of the papers refer to Anderson and van Wincoop (2003) theoretical foundation and derive the demand function for a specific product by maximizing the constant elasticity of the substitution utility function to the given income constraint.

Similarly, the supply function is derived by maximizing the profit function subject to the resource allocation in the exporting country. Furthermore, Anderson and van Wincoop (2003) introduce the multilateral resistance term that captures the two countries' relative instead than bilateral trade cost. According to them, bilateral trade between the two countries depends on their economic size relative to the rest of the world's economic size. The trade barriers are divided by the multilateral resistance term expressed as a price index.

4.1.1. Model's derivation

As the above paragraph explains, Anderson and van Wincoop (2003) derive a gravity model for aggregate trade flows. Power (2007) applies their model to the sectoral trade data

assuming monopolistic competition. Following the above two studies, we derive a gravity equation for the commodity trade flows. We assume a monopolistic competitive firm that produces different brands of commodity k that are differentiated by the place of origin (country) i . Country j (that imports from country i) allocates its resources between the production of commodity k (Y_{jk}) and expenditure on commodity k (E_{jk}). The different brands of commodity k follow a homothetic aggregator across the exporter and hold the form of constant elasticity of substitution (CES) expressed as η_k .

If C_{ijk} is the consumption of commodity k in region j imported from region i , then the demand equation of commodity k in country j can be derived as follows.

$$C_{ijk} = \left[\frac{P_{ijk}}{P_{jk}} \right]^{1-\eta_k} E_{jk}. \quad (1.1)$$

The above equation describes that the consumption of commodity k in country j (produced in country i) rely on the c.i.f. price of commodity k shipped from country i to j (P_{ijk}), the CES price index at country j (P_{jk}), and the expenditure on commodity k at country j (E_{jk}). The CES price index can also be expressed as given;²⁶

$$[P_{jk}]^{1-\eta_k} = \sum_j [P_{ijk}]^{1-\eta_k}. \quad (1.2)$$

The c.i.f. price does not include the transportation cost. So, to convert the c.i.f. price into f.o.b., we introduce the transportation cost between country i and j (T_{ijk}). We can write the f.o.b. price of commodity k in producer i as follows;

$$P_{ijk} = P_{ik} T_{ijk} \quad (1.3)$$

Now, we solve for the P_{ik} from the market clearing condition and substitute the results in equations (1.1) and (1.2) to derive the gravity equation.

$$X_{ijk} = \frac{Y_{ik} E_{jk}}{Y_{wk}} \left[\frac{T_{ijk}}{P_{ik} P_{jk}} \right]^{1-\eta_k} \quad (1.4)$$

²⁶ The c.i.f. price stands for the cost, insurance and freight. The c.i.f. is the agreement between the buyer and the seller in which the seller must bear the insurance and the transportation cost. On the other hand, the f.o.b. indicates the free on board price and the buyer will be responsible once the goods are loaded in the ship.

The above equation indicates that the country's j imports of product k from country i depend on the country's i production, the expenditure of country j on commodity k , the world's production of commodity k and the multilateral resistance term (P_{ik}, P_{jk}).

4.2. Estimation approach

As discussed in the literature review section, there are two unsettled issues regarding the estimation of the gravity equation. These problems are endogeneity and the zero trade flows problem. The following section discusses these issues in detail and explains the estimation approaches to the aforementioned issues.

4.2.1. Endogeneity bias

The most common problem prevailing in the literature in estimating the gravity equation is the problem of endogeneity bias. The endogeneity arises when the gravity equation's independent variables correlate to the error term (ϵ_{ij}), which violates the OLS assumption. In such a case, the OLS estimator will yield inconsistent and biased estimates. Baier and Bergstrand (2007) highlight the causes of the endogeneity bias and believe that the endogeneity arises due to the omission of important variables. The omitted variable problem may occur due to the correlation between an FTA's formation and the unobservable factors that conclude in the error term. In determining the possible correlation between the FTA_{ij} and the ϵ_{ij} in the gravity equation, it's necessary to know the factors determining the formation of an FTA between countries. Baier and Bergstrand (2004) is the first study that empirically shows the determinants of FTA. They believe that there is more possibility of a trade agreement between two countries if they have less distance, the same GDP size and higher differences in their relative factor endowments. The probability of signing an agreement also increases if there is a chance of welfare gain by the possible trade creation. The factors mentioned above may create endogeneity as they play a significant role in forming an FTA. Baier and Bergstrand (2002, 2004b) and Magee (2003) use the instrumental variable technique to overcome the endogeneity in the cross-section data. However, Baier and Bergstrand (2004a) highlight that the instrumental variable method (IV) is not suitable to control for the endogeneity in the gravity equation using cross-section data due to the problems in selecting proper IVs. Baier and Bergstrand (2007) conclude that instead of using the IVs method to the cross-section data, one should use the fixed-effect model to the panel data as the possible source of endogeneity bias could be unnoticed time-invariant heterogeneity. Following the literature, we use the

exporter and importer fixed-effect model to the panel data and address the unobserved time-invariant heterogeneity between the trading partner.

4.2.2. The zero-trade flows problem and Poisson Pseudo Maximum Likelihood (PPML) estimator

Another problem regarding the gravity model estimation is the zero trade flows issue. The literature on the problem of zero trade flows starts with the work of Haveman and Hummels (2004), whereas Felbermayr and Kohler (2006) and Helpman et al. (2008) explain the importance of zeros in trade flows. The problem of zero may arise because of three reasons. First, this zero-trade problem occurs when there is no actual trade between the pair of countries. The zero-trade value between two distant and small economies could occur because of enormous variable and fixed costs. It would not be surprising to find zero trade in a certain year between Tajikistan and Togo. Behar and Nelson (2014) describe that all the firms in a country may not be engaged in international trade due to the high fixed cost. They explain that all the firm productivity levels may not be enough to generate sufficient profit to cover the fixed trade cost. Hence, the high fixed cost of exporting may generate zeros as no firm may find it profitable to export. Second, the zero trade flows may be the outcome of rounding errors. If the trade flows are measured in thousands of dollars, the trade value may be recorded as zero if it is less than a certain threshold level. In particular, zero-trade values may frequently occur when we use disaggregated trade data. Third, the zeros may arise because of missing information that is wrongly registered as zero (Silva and Tenreyro, 2006).

In literature, several methods are used to deal with this zero-trade flow problem. First, the issue is addressed by dropping the observation with zero trade values, as the log of zero is undefined. However, dropping observation with zero trade may yield biased and inconsistent results due to the sample selection bias. The zero trade values between the two countries may arise due to the lack of cultural and political relations, the bilateral distance, and the difference between their production structures. The second method is an ad-hoc solution by replacing the zero with a small value (i.e., 0.0001) and then estimating the equation with the Tobit model. However, this ad-hoc solution has no space in the statistical theory. Third, Linders and Groot (2006) use two steps Probit model proposed by Heckman (1979). In the first step, the selection equation describes the future trade between the two countries based on the firm's decision and then estimates the traditional gravity equation in the second step (Helpman *et al.*, 2008). This method seems appropriate when the trade values appear arbitrarily. However, the firm's

decision on trade is not well established theoretically, and it's not easy to select the appropriate explanatory variables for the selection model. It may cause multicollinearity and can increase the variance of errors if the same variables are used in the sample and selection equation (Urata and Okabe, 2013).

The fourth solution to this problem is using the Poisson Pseudo Maximum Likelihood (PPML) estimator. The PPML estimator was developed and proposed by Silva and Tenreyro (2006) as it takes the zero values assuming that the values are missing as a result of rounding error.

The log-linearize method may lead to several problems in estimating the gravity equation. For example, if $y=0$, then $\ln(y)=\infty$ and OLS will not be feasible. In such a case, the problem can be solved by using the Poisson Pseudo Maximum Likelihood (PPML) estimator by estimating the equation in the multiplicative form. However, Martin and Pham (2008) criticize the use of PPML and believe that the PPML estimator yields biased results if the data contains frequent zeros. Silva and Tenreyro (2011) extend their study and use the data with frequent zeros to answer this problem. They conclude that the PPML estimator still yields well behaved results even when the gravity model's dependent variable has a large proportion of zeros.

The use of the PPML estimator has several advantages. First, it deals with the zero trade flows by estimating the model in multiplicative form. Second, taking the dependent variable's logarithm in the presence of heteroscedasticity is inappropriate because the result may lead to an ambiguous conclusion (Silva and Tenreyro, 2006). The PPML estimator efficiently treats the heteroscedastic data through its built-in robustness feature. Third, we can interpret its results as elasticity according to its semi-log model specification (Urata and Okabe, 2014). Based on the advantages and following the literature, we use the fixed effect PPML technique to analyze trade creation and diversion to our aggregate and commodity gravity equation.

4.2.3. Estimation specification

As this study aims to analyze the trade effects of the selected regional trade agreements (NAFTA, EU and ASEAN), we specify the gravity equation estimation for each product as follows²⁷:

$$X_{ijt} = \alpha_0 Y_{it} Y_{jt} \left[\frac{T_{ijt}}{P_{it}, P_{jt}} \right]^{1-\eta}, \quad (1.5)$$

X_{ijk} is the export value of commodity k that flows from country i to j , α_0 is the constant, Y_i and Y_j represent the production and the demand for commodity k . As the demand and production of commodity k are not available for all the periods, we use both exporters' and importers' real GDP.²⁸ We expect that a rise in the real GDP of exporters and importers will increase bilateral trade as it indicates a rise in the production and consumption of both countries. Hence, we expect a positive sign for the product of the real GDP. T_{ijt} shows the cost factors that affect the exports of country i to j . Following the literature, the trade cost T_{ijt} is the linear combination of observable measures expressed as given;

$$T_{ijt} = Dis_{ij}^{\lambda} \cdot \exp(-\beta_1 RTA_{ijt} - \beta_2 Cont_{ij} - \beta_3 LAN_{ij} - \beta_4 col_{ij}). \quad (1.6)$$

In the trade cost equation, the RTA represents the trade agreement between countries i and j . This is a dummy variable and takes unity if both countries i and j have affiliation with the same trading block. It is generally believed that economic integration under the trade agreements increases the commodity trade between the member states through trade creation. In contrast, the trade between members and non-members results in the diversion of trade. Our study analyzes the trade effect of three selected RTAs, i.e., NAFTA, EU and ASEAN, and focuses on trade creation and diversion effect. In order to measure trade creation and trade diversion, we use three types of dummy variables and replace RTA with these dummy variables. The first dummy takes unity when the trade takes place between the two member states and otherwise zero, the second dummy takes unity if the exporter is a member but the importer is not a member state of RTA, whereas the third dummy represents the exports from

²⁷ To make simple the specification of the gravity equation for commodity k , we drop the index k .

²⁸ Instead of using separate variables, we multiply the real GDP of both countries and take its natural logarithm.

non-RTA member to the RTA member.²⁹ Similarly, $CONT_{ij}$ and LAN_{ij} represent the border and the language of countries i and j , respectively. We also use dummy variables as a proxy which yields unity if country i and j have a contiguous and the same official language. These variables are included in the model assuming high trade between countries with a common border and the same official language. Col_{ij} is a dummy variable and represents whether one remains the colony of the other at time t . In the last, the DIS_{ij} shows the geographical distance between the largest cities of country i and country j . It is calculated in kilometres. This variable is included as a proxy for the transportation cost. The distance variable is also included under the assumption that the countries close to each other trade more than the countries having more distance. The higher distance between the countries represents higher trade costs causing low bilateral trade. The second reason is that the countries close to each other have more chances to have a similar culture, heritage, production and consumption pattern. We expect a negative coefficient for this variable. Substituting equation (1.6) in equation (1.5), doing a little mathematics and by adding the country pair fixed effect, we get the gravity equation as follows;

$$X_{ijt} = \exp\left(\alpha_0 + \alpha_{ij} \left(-\beta_1 RTA_{ijt} - \beta_2 Cont_{ij} - \beta_3 LAN_{ij} - \beta_4 col_{ij}\right)^{1-\lambda}\right) DIS_{ij}^{\lambda(1-\eta)} Y_{it} Y_{jt} P_{it}^{\eta-1} P_{jt}^{\eta-1} + \varepsilon_{ijt}. \quad (1.7)$$

In equation (1.7), P_{it} and P_{jt} are the multilateral trade resistance terms that are not directly observable. Anderson and van Wincoop (2003) introduce these price index terms, expressing that the studies that only incorporate the bilateral cost factors and don't consider multilateral resistance suffer from omission bias. Furthermore, they believe that the trade flows between the two countries depend on their bilateral trade cost relative to the cost they bear by trading with the rest of the world. In simple words, multilateral trade resistance is the size of trade obstacles that both countries face in their trade with the rest of the world. According to Baier and Bergstrand (2007), multilateral trade resistance depends on three factors: world trade resistance, exporter, and importer trade resistance. The first term is "world trade resistance," which is defined as the trade barriers that each country in the world faces. When the world trade resistance is high, it is difficult for each country to trade, hence decreasing the bilateral trade between countries i and j . The second term shows the importer's multilateral resistance (MRT), described over the entire exporters. The importer's high MTR increases the bilateral trade between country i and j , as it shows that the importer faces high import costs from other

²⁹ In other words, the third dummy represent the imports of RTA member states from the non-members. This dummy is included because this is generally believed that the RTA member countries divert their imports from efficient non-RTA member to the inefficient RTA states, resulting in trade diversion.

destinations. The third and last term shows the multilateral resistance of the exporter, explained over entire importers. The high exporting MTR increases the bilateral trade as it is costly for the exporter "j" to export to other countries. Hence, it will inflate the importance of the bilateral trade cost factors' variations when multilateral resistance is neglected. The difference between the traditional and the new version of the gravity model is that the newly developed model introduces the MTR instead of only incorporating the bilateral resistance term. The multilateral resistance term (MTR) introduces sustainability in bilateral trade, which was missing before.

There are several methods for proxying MTRs. Anderson and van Wincoop (2003) use the irritative method to build the increasing cost impact of multilateral trade barriers. They use the observable factors of trade barriers and then estimate the p_i and p_j using the non-linear estimation technique. However, the studies do not use this method frequently due to non-linearity. Adam and Cobham (2007) believe that this model is only feasible for Anderson and van Wincoop (2003) work as they use a limited number of observations and estimate the model for a single cross-section. This method looks inappropriate in our case as we use panel data of fifty-five countries over the period of 2000-2018. The second method for multilateral resistance is to directly include each exporter and importer's policy variables. Baier and Bergstrand (2007) suggest the use of a first-order Taylor series extension instead of a non-linear estimation technique to generate the MTR using OLS and compute the separate components of P_i and P_j . Whereas the third method that accounts for the multilateral trade resistance (MTR), and is widely used in the literature, is the exporter and importer fixed effect to proxy for the multilateral trade resistance (MTR). This method replaces the multilateral resistance term with N exporters and importers-specific indicators for P_i and P_j . The importer and exporter fixed effect captures multilateral trade resistance precisely and generates consistent and unbiased results (Fenestra, 2005).

We use the gravity equation in multiplicative form for estimation purposes instead of the log linearized process to protect the zeros trade flows.³⁰ As described above, we use the fixed effect Poisson Pseudo Maximum Likelihood estimation to handle the endogeneity and zeros-trade flows problem. We use three types of dummy variables for each regional trade agreement to assess the trade creation and diversion and replace the RTA with these variables. Furthermore, we use the year dummy (TD) variable to capture the time-variant unobservable

³⁰ The log linearization process drops the zeros as the log of the zero is undefined. Westerlund and Wilhelmsson (2011) explains the estimation of the multiplicative form (exponential form) of the gravity model as an alternative to the log-linearized to tackle the zero trade flows.

effect.³¹ We get the following regression function after incorporating all the factors described above³².

$$\begin{aligned}
X_{ijt} = & \alpha_0 + \alpha_{ij} + \delta_1 \ln(Y_{it} \times Y_{jt}) + \delta_2 \ln(POP_{it} \times POP_{jt}) + \delta_3 \ln(Distance_{ij}) + \delta_4 (Contiguous_{ij}) \\
& + \delta_5 (Language_{ij}) + \delta_6 (Colony_{ij}) + \beta_1 (EU - EU_{ij}) + \beta_2 (EU - non.EU_{ij}) + \beta_3 (non.EU - EU_{ij}) \\
& + \gamma_1 (NAFTA - NAFTA_{ij}) + \gamma_2 (NAFTA - non.NAFTA_{ij}) + \gamma_3 (non.NAFTA - NAFTA_{ij}) + \\
& \omega_1 (ASEAN - ASEAN_{ij}) + \omega_2 (ASEAN - non.ASEAN_{ij}) + \omega_3 (non.ASEAN - ASEAN_{ij}) + \varepsilon_{ijt}
\end{aligned} \tag{1.8}$$

whereas, X_{ijt} indicates the exports of country i to j at time t , $Y_{it} \times Y_{jt}$ is the multiplication of both countries' GDP at time t , $POP_{it} \times POP_{jt}$ is the multiplication of both countries population, and $Distance_{ij}$ is the distance between country i and j . The other dummy variables, such as $contiguous_{ij}$ takes 1 if the trading partner share their border, $colony_{ij}$ takes 1 if country i and j were engaged in colonial affiliation, and $language_{ij}$ takes 1 if both countries have a common official language. The other dummy variables, such as EU-EU, take unity if the exporter and importer belong to the European Union, EU-non.EU takes unity if the exporter is from the EU and the importer is a non-EU member, and non.EU-EU takes 1 if the exporter is a non-EU member, but the importer is an EU member state. The rest of the dummy variables represent the same for NAFTA and ASEAN and measure trade creation and trade diversion in these regions.

4.3. Data and its statistical description

As this study aims to capture the effect of the trade agreement on the exports of the European Union, NAFTA and ASEAN, we use the panel data over the period of 2000 to 2018. We use the export data of fifty-five countries and measure the EU, NAFTA, and ASEAN trade effects by focusing on trade creation and trade diversion. We take the aggregate and disaggregated (1-digit commodity) export data from the World Integrated Trade Solutions (WITS), a World Bank website that provides trade flows and tariff data. We take the data of real GDP and populations from the World Development Indicator (WDI), whereas the data on

³¹ For simplicity, we don't write the exporter, importer, and time fixed effect in the equation (8).

³² The equation is written in the simplest form.

the bilateral distance and the other variables that are used as information cost is taken from the CEPII³³.

4.3.1. The statistical description of the sample data

Before discussing the estimated model results, we present the export value (Thousand US dollars) and each industry's average annual growth rate for ASEAN, EU, and NAFTA in tables 1.3. For simplicity and comparison, we only present the starting and ending year (i.e., 2000 and 2018) to get a picture of the selected regions' commodity trade.

Table 1.3 portrays the export value, share and average annual growth rate of ASEAN, NAFTA, and EU industries over the sample period. The machinery and transport equipment industry, miscellaneous manufactured articles, mineral fuels and lubricants, and manufactured goods show a high export share in the ASEAN's trade. The industry "Commodity and Transactions" reflects a rapid expansion in the ASEAN's exports and possesses the highest average growth of 15.43 % over the period. The exports of the remaining industries also grow significantly and reflect the ASEAN's role in world trade. Regarding the export share of different sectors in ASEAN's exports, Machinery and Transport equipment is on the top of the list, holding 42.97% in 2018. Apart from this, Minerals, fuels and lubricants, Chemicals, Miscellaneous manufactured articles, and Manufactured goods also possess a significant trade share of 13.24%, 10.04%, 9.74% and 8.38%, respectively. In NAFTA's case, the industries of Machinery and Transport equipment, Minerals fuels and lubricants, chemicals, and manufactured goods possess high shares of 36.09%, 12.23%, 11.34% and 8.95% in NAFTA's exports, respectively. Like ASEAN, the average export growth of the industry "commodity and transaction" is the highest among all the NAFTA's industries and grows with an average rate of 12.49%. Similarly, the exports share of the EU is dominated by the industry Machinery and transport equipment (38.58 %), followed by Chemicals (16.29%) and manufactured goods (12.72%). Apart from these industries, the other sectors also possess a significant share in the EU's exports, except the Animals and Vegetable sector, which has only a 0.41% share.³⁴ The industry "Animals and vegetable oils" shows the highest average growth rate of 9.68%, whereas the remaining industries' exports also grow at a reasonable rate.

³³ The Centre d'Études Prospectives et d'Informations Internationales (CEPII) is a French institute for the international Economics. <http://www.cepii.fr/CEPII/fr/cepii/cepii.asp>

³⁴ These all values reflect the shares of the respected industries in year 2018.

Moving toward our main goal of capturing the trade creation and trade diversion of regional trade agreements, we measure the export intensity index of each product for each RTA. The index for each product is measured as the ratio of intra-regional exports and the total exports of the region (Intra-regional export of product i /Region's total export of product i) to the exports of the world to the region and the total exports of the world (world export of product i to the region/world's total export of product i). The trade flow is greater than expected between the region, given their position in world trade, if the value of the export intensity index is greater than 1. The export intensity index of each product and RTA are given in appendix 1-C (a-j). The index of ASEAN for the products coded as 01, 05, 07, 08 and 09 are higher than the EU and NAFTA. However, the intensity of the above-mentioned products decreases over time. The export intensity index of the industry "Beverages and Tobacco" reached a maximum of 14.70 in 2005, then showed a declining trend and reached 7.34 in 2018. On the other hand, NAFTA's export intensity for the industries coded as 00, 02, 03, 04 and 06 stood highest in 2018 among the selected RTAs. The industry coded as "04" expresses an increasing trend and reached 5.59 in 2018. The NAFTA's index for the product "07" is lower than one throughout the sample period. Whereas the Index of the EU for all the industries lies between 1 and 3 indicating that intra-regional trade is greater than expected given their position in the world. It is difficult to draw a conclusion of trade creation and trade diversion based on the export intensity index. We move to the next section to measure the trade creation and diversion of regional trade agreements. Furthermore, the descriptive statistics of the variables used in the research study are given in table 1.4.

Table 1.3: Export value, shares and the average annual growth rate of products in the selected region

		ASEAN				
SITC	Industry	2000		2018		Average Annual growth rate (2000-2018)
		Export value (Thousand US dollars)	Share in total exports	Export value (Thousand US dollars)	Share in total exports	
0	Food and live animals	18367702	4.88	57241379	5.55	7.13
1	Beverages and tobacco	1475155	0.39	6604500	0.64	9.03
2	Crude materials, inedible, except fuels	10569434	2.81	39275404	3.82	10.03
3	Mineral fuels, lubricants and related materials	37261318	9.89	1.36E+08	13.24	10.25
4	Animal and vegetable oils and fats	5012240	1.33	29347341	2.85	12.93
5	Chemicals	18011056	4.78	1.03E+08	10.04	11.22
6	Manufactured goods classified chiefly by material	28862892	7.66	86325762	8.38	7.16
7	Machinery and transport equipment	2.06E+08	54.71	4.42E+08	42.97	5.15
8	Miscellaneous manufactured articles	44684672	11.86	1E+08	9.74	5.43
9	Commodity and transacts. Not class. Accord. To kind	6372015	1.69	28340657	2.75	15.43

NAFTA						
SITC	Industry	2000		2018		Average Annual growth rate (2000-2018)
		Export value (Thousand US dollar)	Share in total exports	Export value (Thousand US dollar)	Share in total exports	
0	Food and live animals	49308885	4.78	1.42E+08	7.19	6.38
1	Beverages and tobacco	8315050	0.81	12922280	0.65	2.71
2	Crude materials, inedible, except fuels	48327521	4.68	1.13E+08	5.70	5.70
3	Mineral fuels, lubricants and related materials	61914628	6.01	2.42E+08	12.23	11.05
4	Animal and vegetable oils and fats	1446897	0.14	5401903	0.27	9.54
5	Chemicals	84443293	8.18	2.25E+08	11.34	5.92
6	Manufactured goods classified chiefly by material	1.09E+08	10.56	1.77E+08	8.95	3.43
7	Machinery and transport equipment	5.24E+08	50.74	7.15E+08	36.09	2.47
8	Miscellaneous manufactured articles	1.11E+08	10.80	1.71E+08	8.63	2.57
9	Commodities and transacts. Not class. Accord. To kind	34312298	3.32	1.77E+08	8.93	12.49

EU						
SITC	Industry	2000		2018		Average Annual growth rate (2000-2018)
		Export value (Thousand US dollar)	Share in total exports	Export value (Thousand US dollar)	Share in total exports	
0	Food and live animals	1.24E+08	5.63	4.12E+08	7.38	7.30
1	Beverages and tobacco	30294698	1.38	81072917	1.45	5.94
2	Crude materials, inedible, except fuels	50644011	2.30	1.46E+08	2.62	7.33
3	Mineral fuels, lubricants and related material	82280187	3.74	2.54E+08	4.56	9.43
4	Animal and vegetable oils and fats	5421090	0.25	22842802	0.41	9.68
5	Chemicals	2.66E+08	12.09	5.58E+09	16.29	7.47
6	Manufactured goods classified chiefly by materials	3.44E+08	15.61	7.65E+08	13.72	5.50
7	Machinery and transport equipment	9.04E+08	41.05	2.15E+09	38.58	5.49
8	Miscellaneous manufactured articles	2.54E+08	11.54	7.03E+08	12.61	6.16
9	Commodity and transacts. Not class. Accor. To kind	86587028	3.93	1.33E+08	7.42	4.96

SITC is an abbreviation for the Standard International Trade Classification, which classifies the product into different groups.

The annual average growth rate is calculated by the simple arithmetic mean.

The export share of each industry for each region is calculated as the percentage share in the total region's exports.

Table 1.4: Descriptive statistics

Variable	Observation	Mean	Std. Dev.	Min	Max
Log of GDP	56430	52.579	2.489	43.347	60.524
Log of population	56430	32.357	2.591	23.946	41.336
Log of Distance	56430	8.315	1.043	4.088	9.875
Colony	56430	0.028	0.164	0	1
Language	56430	0.086	0.281	0	1
Contiguous	56430	0.037	0.189	0	1
Aggregate Export	56340	4010405	1.62e+07	0	4.80e+08
Food and live animals	56429	175483.09	834001.1	0	22937948
Beverages and tobacco	44189	34650.878	153754.72	0	5452201.5
Crude materials. Except food/fuel	50161	122413.91	934223.71	0	62314312
Mineral fuel/lubricants	39159	320093.3	2276731.2	0	1.206e+08
Animal/veg oil/fat/wax	35165	25095.463	155327.07	0	5558558.5
Chemicals/products n.e.s	53112	405121.1	1696880.5	0	34122100
Manufactured goods	53765	433391.42	1845529	0	57089944
Machinery/transport equipment	56429	1249495.8	6932978.2	0	2.476e+08
Miscellaneous manufacture arts	54186	414251.16	2486105.2	0	1.453e+08
Commodities n.e.s	42067	171373.55	1018281.8	0	62639800
EU-EU	56430	0.202	0.401	0	1
EU-nonEU	56429	0.253	0.435	0	1
nonEU-EU	56430	0.244	0.43	0	1
NAFTA-NAFTA	56430	0.002	0.045	0	1
NAFTA-nonNAFTA	56430	0.053	0.223	0	1
nonNAFTA-NAFTA	56430	0.053	0.223	0	1
ASEAN-ASEAN	56430	0.01	0.1	0	1
ASEAN-nonASEAN	56430	0.099	0.299	0	1
nonASEAN-ASEAN	56430	0.099	0.299	0	1

Note: Nes stand for not exactly specified.

EU-EU is a dummy variable that represents trade between two member states of the EU, EU-non.EU shows the export of EU country to non-EU country, whereas nonEU-EU represent the export flows from non.EU to the EU states.

5. The results

In this section, we present the results of the commodity gravity model and explore the effects of regional trade agreements (RTA) on commodity trade flows. First, we present the trade effects of the European Union (EU), the North American Free Trade Agreement (NAFTA), and the Association of Southeast Asian Nations (ASEAN). We present the trade effects results at the aggregate level and disaggregated level. Second, we present the results of the other variables included in the gravity model. Third, we check for robustness and give the result in this section.

5.1. Trade creation and trade diversion of the selected RTAs

Following the creation of a regional trade agreement, the trade effects of such agreements can be judged at three aspects by analyzing the changes in exports: intra-regional exports, exports from RTA member states to non-members, and from non-members states to the member states of RTA. The results of trade creation and diversion are given in table 1.5.

Before exploring the trade creation and the trade diversion of each RTA at the commodity level, we estimate the gravity model using the aggregate export data. The first row in table 1.5 indicates the trade effects of the EU on their aggregate exports. The column (EU/EU) reflects the trade between two EU member states and possesses a significant positive value. It indicates that the formation of the EU has significantly increased trade within the region. However, the aggregate exports of the EU to the Non-EU countries (EU/Non.EU) are negatively affected over time.

Similarly, we also analyze the effect of the EU on the exports from non-EU to the EU countries, i.e. imports of the EU from non-EU countries. It also indicates a negative sign showing a decline in the EU imports from the non-EU countries (Non.EU/EU). To know the net effect of the EU, we combine these three results and present the net effect in the last column. The result reflects trade creation effects when we use the aggregate trade flows. Our results match the previous studies (e.g., Wilhelmsson, 2006; Akram and Rashid, 2016; Zolin and Uprasen, 2018) that conclude that the EU results in significant trade creation and limited trade diversion.

However, this type of analysis assumes a uniform impact of tariff elimination/reduction on different product trade flows. As the trade policies' impact can be different for different

products, we capture the impact of regional trade agreements on the trade flows of different products and move to disaggregated level analysis.

In the analysis of disaggregated trade flows, we find that the intra-EU exports of most products increase over time. The results are reported in the first column of table 1.5. The results indicate that all the products' trade flows significantly increase, except Chemical and Miscellaneous manufactured products. Secondly, we also analyze the impact of EU exports to non-EU member states to capture the trade effect of the EU. The results of the EU's exports to non-EU are reported in the 2nd column (EU/Non.EU). The results reflect an expansion in the exports of four industries from the EU to the non-EU member states. These industries are coded as 02, 03, 04 and 07. The two sectors (coded as 05 and 08) have a significant and negative coefficient and indicate a decrease in the EU's exports to non-EU countries. Both these industries possess high shares in the total exports of the EU.³⁵

Thirdly, we measure the effect of the EU formation on the exports of non-EU countries to the EU countries (non.EU/EU), i.e., the imports of EU from non-EU countries. The results indicate that the EU's creation negatively affects the product exports of non-members to the EU in most cases. The "Mineral, fuels and lubricant" is the single industry with a significant and positive sign, indicating an increase in the EU's imports from non-member countries.

In the last column, we get the net effect of the EU's creation by combining the three effects mentioned above. We find the trade creation effect for 60% of the product studied, whereas 40% indicate the trade diversion. The industry that shows trade creation effects are coded as 00, 01, 02, 03, 04 and 07. On the other hand, the industry coded as 05, 06, 08 and 09 affirms the trade diversion. The trade creation effect of the aggregate EU trade flows is explained by the net positive effect in 60% of the products. The non-member countries of the EU countries get a tiny advantage or even lose out as a result of trade diversion. The export volume of the non-member countries to the EU decrease as the non-EU countries becomes relatively expensive, and it becomes less expensive for the EU member states to trade with each other. However, Non-EU countries closely integrated in the European Internal Market, such as Norway, get significant trade advantages, although a full EU membership would generate higher average benefits than only being a member of the European Internal Market

³⁵ The share of each industry in the total exports are given in the table (1.3).

(Freeman et al., 2022). Furthermore, the industries that indicate trade diversion are relatively more protective than the other industries.

Table 1.5: Trade creation and trade diversion of the selected regional trade agreements

Trade effect of EU				
SITC and Products	EU/EU	EU/Non.EU	Non.EU/EU	Net trade effects
Aggregate export	1.39***	-0.25***	-0.24***	TC
0 -- Food and live animals	1.19***	-0.10	-0.57***	TC
1 -- Beverages and tobacco	0.78***	0.21	-0.11	TC
2 -- Crude materials. Except food/fuel	0.98***	0.46*	-0.88***	TC
3 -- Mineral fuel/lubricants	1.34***	1.25***	0.45**	TC
4 -- Animal/veg oil/fat/wax	2.63***	1.69***	-0.81***	TC
5 -- Chemicals/products n.e.s	-0.23*	-0.54***	0.05	TD
6 -- Manufactured goods	0.47***	-0.03	-0.52***	TD
7 -- Machinery/transport equipment	1.05***	0.30**	-0.24***	TC
8 -- Miscellaneous manufacture arts	-0.23	-0.80***	-0.23**	TD
9 -- Commodities nes	-0.88***	-1.01	-0.99***	TD

Trade effects of NAFTA				
SITC and Products	NAFTA-NAFTA	NAFTA-NonNAFTA	NonNAFTA-NAFTA	Net trade effects
Aggregate export	2.60***	0.04	0.56***	TC
0 -- Food and live animals	0.84**	0.39	-0.26	TC
1 -- Beverages and tobacco	-0.17	-1.18***	-0.06	TD
2 -- Crude materials. Except food/fuel	0.89**	1.59***	-0.82***	TC
3 -- Mineral fuel/lubricants	2.26**	1.22**	0.32	TC
4 -- Animal/veg oil/fat/wax	2.05***	1.41***	-0.36	TC
5 -- Chemicals/products n.e.s	1.63***	0.15	0.95***	TC
6 -- Manufactured goods	1.78***	-0.23	0.52***	TC
7 -- Machinery/transport equipment	2.69***	0.33	0.72***	TC
8 -- Miscellaneous manufacture arts	1.25***	-0.49**	0.68***	TC
9 -- Commodities nes	-2.02**	-0.97**	-1.77**	TD

Trade effects of ASEAN				
SITC and Products	ASEAN-ASEAN	ASEAN-NonASEAN	NonASEAN-ASEAN	Net trade effects
Aggregate export	3.39***	1.18***	0.964***	TC
0 -- Food and live animals	1.62***	0.94***	0.88***	TC
1 -- Beverages and tobacco	5.01***	1.08***	1.67***	TC
2 -- Crude materials. Except food/fuel	0.52	1.04***	-0.38	TC
3 -- Mineral fuel/lubricants	5.95***	4.41***	2.67***	TC
4 -- Animal/veg oil/fat/wax	3.08***	2.51***	0.94**	TC
5 -- Chemicals/products n.e.s	2.48***	1.03***	1.15***	TC
6 -- Manufactured goods	1.27***	0.50***	0.59***	TC
7 -- Machinery/transport equipment	4.14***	2.29***	1.32***	TC
8 -- Miscellaneous manufacture arts	1.33***	0.72***	-0.41	TC
9 -- Commodities nes	3.43***	1.67***	1.49***	TC

TC indicates trade creation, whereas TD shows trade diversion.

The net effect of the EU is the sum of β_1 , β_2 , and β_3 . For NAFTA, the net trade effect is the sum of γ_1 , γ_2 and γ_3 . Whereas the sum of ω_1 , ω_2 and ω_3 give the net trade effect of ASEAN.

***, **, * indicate the significance at 1, 5 and 10%, respectively.

The number, along with the industry's name, indicate the SITC code of each industry.

nes= Not elsewhere classified

We do the same analysis for NAFTA and find out its trade effects. In the 2nd column, we report the results of the intra-NAFTA trade. The aggregate export from NAFTA to NAFTA increase over time. However, the exports from NAFTA to non-NAFTA countries don't change over time, and we get an insignificant value. Unlike the EU, NAFTA's imports from non-members (exports of non-NAFTA to NAFTA) increase significantly over time. The net trade effect of NAFTA indicates trade creation by combining all three effects. Our findings for NAFTA match previous studies (e.g., Lee and Kennedy, 2016; Heo and Doanh, 2020) that also find the trade creation effect of NAFTA. To know this trade creation in detail, we analyze NAFTA's disaggregated trade flows and explore the trade effect for each industry.

The second column (NAFTA-NAFTA) indicates the intra-NAFTA trade. In intra-NAFTA trade, we find a significant increase in 80% of the products' exports. These industries are coded as 00, 02, 03, 04, 05, 06, 07 and 08. The intra-NAFTA's exports of industry "commodities n.e.s" decrease over time, whereas the exports of "beverages and tobacco" remain the same. The third column shows the exports from NAFTA to non-NAFTA countries (NAFTA-non.NAFTA). The results indicate that 30% of industries reflect a significant

increase, whereas 30% of the industries affirm a decrease in exports from NAFTA to non-NAFTA countries. The industries coded as 02, 03 and 04 reflect an increase, whereas 01, 08 and 09 show a decrease in exports from NAFTA to non-NAFTA. The fourth column presents the results of NAFTA's imports from non-NAFTA members. The results indicate that 40% of the NAFTA's industries' imports increase over time, whereas 20% of the industries reflect a decrease in NAFTA's imports from non-NAFTA member states. The sectors that possess positive trade effects are coded as 05, 06, 07 and 08, while the industries 02 and 09 have a negative trade effect. To find NAFTA's net trade effects on the products' trade flows, we do the same as the EU and combine the above three effects of NAFTA. Except for two, all the industries confirm trade creation effects. The industries coded as 00, 002, 03, 04, 05, 06, 07 and 08 affirm trade creation, whereas 01 and 09 reflect trade diversion effects. The trade creation in the aggregate flows is explained by the net positive trade effect of these industries. These industries also possess high trade shares in NAFTA's trade. Heo and Doanh (2020) also think that the magnitude of trade creation is higher than trade diversion in NAFTA. Most of the NAFTA industries show trade creation because of the fact that more than half of the products enter the US duty-free. The two industries that reflect trade diversion are those which are relatively protective, and the average tariff rate on the imports of these industries are high. For example, the average tariff rate of the US on beverages and tobacco is 19.1%. Similarly, the US imposed a tariff rate of 25% on the imports of beverages and tobacco from the EU in 2018. Such a high tariff rate results in trade diversion in these specific industries.

Along with the other RTAs, we also find ASEAN's trade effects by focusing on trade creation and diversion effects. In our first step, we use aggregate export data to investigate the trade effects of ASEAN. The results show that intra-ASEAN exports, ASEAN's exports to non-ASEAN countries, and non-ASEAN's exports to ASEAN expand over time. Hence, we find the trade creation effects of ASEAN in aggregate trade flows. To better understand the trade creation in aggregate trade flows, we move to the disaggregated analysis and do the same as we did for the EU and NAFTA. The results indicate that the intra-ASEAN trade of all the products expands over time, except "crude materials" given in the second column. The third column shows exports of ASEAN to non-ASEAN. The results indicate a significant increase in exports from ASEAN to non-ASEAN countries. The fourth column displays the trade effect of ASEAN on its imports from non-ASEAN countries. Except for the "crude materials" and "miscellaneous manufactures," ASEAN's imports of all the industries significantly increase over time. The net effect of ASEAN is given in the fifth column, which shows trade creation

for all the industries. It appears that the general boost in ASEAN export to member and non-member countries after its creation has improved its competitiveness and become a more attractive source of imports for the world in general. The currency devaluation of ASEAN countries during the Asian financial crises have made their export less expensive and increased their competitiveness with the rest of the world.

5.2. Results of standard variables in the gravity equation

In our first step, we examine the gravity equation (equation 1.8) using the aggregate trade flows and report the results in table 1.6. The results indicate that most of the variables' signs are according to the theory. The product of both countries' GDP has a positive and significant coefficient on the aggregate export flows. This indicates that the trade between the two countries depends on their economic size. The higher GDP of the trading partner reflects both countries' production and absorption capacity. Similarly, we also measure the impact of the trading partner population's product on the export flows. The results reveal an adverse effect of the population on the export flows. Frankel (1997) explains the negative sign as the high population countries with natural resources and a big domestic market are less import dependent. Similarly, the high population reduces the available quantity of exports due to high domestic consumption.

The trade cost's assessed coefficient in our model, proxied by the bilateral distance, possesses a negative sign. The result is according to the theory and indicates that the high trade cost reduces bilateral trade. The other dummy variables, such as contiguous, language and colony, are used to measure the other trade costs. The language and colony possess their expected positive sign, whereas the contiguous possess an unexpected negative sign.³⁶

In the second step, we replace the aggregate trade flows with the disaggregated trade flows and estimate the gravity equation. We report each industry's results in table 1.7 under the heading of the product's name. The results indicate that most of the variables possess the expected coefficient sign. The GDP's product of the trading partner, used to capture the absorption and production capacity, holds the expected positive sign in the case of all the products. The positive and significant coefficient of the trading partner's GDP indicates that the trade volume of these industries increases with the economic size of the trading partners. Similarly, the population's product of exporters and importers have a negative and significant

³⁶ The negative sign of contiguous is due to accounting for the multilateral resistance term (MRT). Once we ignore the MRT and run the model without the fixed effect, we get the expected positive sign of the contiguous

sign in four cases. The industries whose trade is negatively affected by the population's size are coded as 01, 05, 08 and 09. On the contrary side, we find a significant and positive impact of

Table 1.6: Coefficient estimates of the gravity model in aggregate export flows

Aggregate Export		
Variable	FE PPML	PPML
GDP	0.84*** (0.03)	0.87*** (0.01)
Population	-0.37*** (0.02)	-0.08*** (0.01)
Distance	-0.53*** (0.1)	-0.52*** (0.01)
Contiguous	-0.53*** (0.01)	1.04*** (0.04)
Language	0.45*** (0.03)	0.52*** (0.03)
Colony	0.18*** (0.02)	0.07** (0.03)
EU-EU	1.39*** (0.02)	0.46*** (0.04)
EU-non.EU	-0.25*** (0.06)	-0.72*** (0.03)
Non.EU-EU	-0.24*** (0.04)	-0.53*** (0.02)
NAFTA-NAFTA	2.60*** (0.17)	-0.08 (0.08)
NAFTA-non.NAFTA	0.04 (0.09)	-1.12*** (0.03)
Non.NAFTA-NAFTA	0.56*** (0.07)	-0.39*** (0.04)
ASEAN-ASEAN	3.39*** (0.12)	1.993*** (0.08)
ASEAN-nonASEAN	1.18*** (0.06)	0.41*** (0.04)
Non.ASEAN-ASEAN	0.96*** (0.07)	0.43*** (0.04)
Log-likelihood:	-2.993e+10	-5.991e+10
Observations	42768	42768
R-squared	0.89	0.66

FE-PPML indicates the results of the exporter, importer, and year fixed effect Poisson Pseudo Maximum Likelihood, where PPML indicates the results without the fixed effect.

Values in brackets, next to the coefficients, are the robust standard error.

***, **, and * reflect the statistical significance of the variable at 1%, 5%, and 10%, respectively.

GDP and population represent the product of trading partners' GDP and population, respectively.

population size on the export flows of "animals, vegetable oil, and fat". Matyas (1997) interprets the positive coefficient of the population as a result of the high labour force, the level of specialization and more quantity of goods to export. The distance, used as a proxy for trade cost, holds the expected negative sign for all industries. This shows that the trade flows of all the products are highly affected by the trade cost. The other dummy variables, such as contiguous and colony, have the expected positive sign in most cases. The common language

positively affects the exports of seven products, whereas it negatively affects the exports of industry "crude materials, except food and fuel".³⁷

³⁷ We don't find the impact of a common language on the exports of "crude material" once we ignore the multilateral trade resistance and estimate the model without the fixed effects.

Table 1.7: Coefficient estimates of the gravity model at the product level

Variable	0 -- Food and Live Animals		1 -- Beverages and Tobacco		2 -- Crude Material. Except Food/Fuel		3 -- Mineral Fuel/Lubricants	
	FE PPML	PPML	FE PPML	PPML	FE PPML	PPML	FE PPML	PPML
GDP	0.79*** (0.08)	0.72*** (0.04)	1.26*** (0.12)	1.02*** (0.06)	0.87*** (0.08)	0.78*** (0.08)	0.70*** (0.14)	0.88*** (0.08)
Population	0.06 (0.08)	-0.03 (0.03)	-0.32*** (0.11)	-0.24*** (0.05)	-0.11 (0.10)	0.02 (0.05)	0.16 (0.17)	-0.25*** (0.07)
Distance	-0.56*** (0.05)	-0.51*** (0.07)	-0.33*** (0.11)	-0.33*** (0.12)	-0.57*** (0.06)	-0.27* (0.15)	-1.14*** (.08)	-0.89*** (0.15)
Contig	0.81*** (0.14)	0.74*** (0.17)	0.12 (0.20)	0.19 (0.25)	0.81*** (0.12)	0.72*** (0.18)	0.56*** (0.17)	0.30 (0.32)
Language	0.26** (0.13)	0.07 (0.18)	0.42** (0.20)	0.39* (0.23)	-0.25* (0.15)	0.05 (0.14)	0.24 (0.20)	-0.05 (0.34)
Colony	0.29** (0.13)	0.21 (0.18)	0.51*** (0.13)	0.53*** (0.18)	0.42*** (0.12)	0.10 (0.14)	0.10 (0.24)	0.29 (0.21)
EU-EU	1.19*** (0.19)	0.51*** (0.14)	0.78*** (0.21)	1.46*** (0.21)	0.98*** (0.25)	-0.21 (0.22)	1.34*** (0.33)	-1.19*** (0.29)
EU-Non.EU	-0.10 (0.16)	-0.70*** (0.09)	0.20 (0.21)	0.85*** (0.16)	0.46* (0.25)	-0.94** (0.36)	1.25*** (0.28)	-1.21*** (0.24)
Non.EU-EU	-0.57*** (0.16)	-0.71*** (0.13)	-0.11 (0.15)	-0.24* (0.14)	-0.88*** (0.15)	-1.29*** (0.23)	0.45** (0.18)	-0.08 (0.26)
NAFTA-NAFTA	0.84** (0.46)	0.47 (0.38)	-0.17 (0.52)	0.80 (0.75)	0.89** (0.44)	-0.26 (0.35)	2.26** (1.11)	0.66 (0.49)
NAFTA-Non.NAFTA	0.39 (0.24)	0.13 (0.21)	-1.18*** (0.36)	-0.41 (0.27)	1.59*** (0.27)	0.24 (0.55)	1.22** (0.57)	-0.56* (0.30)
Non.NAFTA-NAFTA	-0.26 (0.27)	-0.18 (0.21)	-0.06 (0.28)	0.07 (0.20)	-0.82*** (0.15)	-1.65*** (0.46)	0.32 (0.59)	-0.06 (0.30)
ASEAN-ASEAN	1.62*** (0.29)	1.38*** (0.20)	5.01*** (0.53)	3.51*** (0.35)	0.52 (0.48)	0.70** (0.29)	5.95*** (0.60)	2.34*** (0.23)
ASEAN-Non.ASEAN	0.94*** (0.19)	1.01*** (0.18)	1.08*** (0.39)	0.44 (0.31)	1.04*** (0.31)	0.75** (0.30)	4.41*** (0.37)	1.71*** (0.28)
Non.ASEAN-ASEAN	0.88*** (0.19)	0.71*** (0.15)	1.67*** (0.46)	0.67** (0.30)	-0.38 (0.28)	-0.35* (0.21)	2.67*** (0.43)	1.20*** (0.28)
R-square	0.88	0.68	0.76	0.52	0.79	0.27	0.86	0.49
Log-likelihood	-2.125e+09	-4.476e+09	-5.683e+08	-9.043e+08	-1.778e+09	-4.857e+09	-5.519e+09	-1.198e+10
Observations	51889	51889	44188	44188	50160	50160	39103	39158
Percentage of zero	8.04		21.69		11.10		30.60	

Variable	4 -- Animal/Vegetable Oil/Fat/Wax		5 -- Chemicals/Products n.e.s		6 -- Manufactured Goods		7 -- Machinery/Transport Equipment	
	FE PPML	PPML	FE PPML	PPML	FE PPML	PPML	FE PPML	PPML
GDP	0.296** (0.126)	0.46*** (0.08)	1.09*** (0.07)	0.92*** (0.03)	0.70*** (0.07)	0.66*** (0.04)	0.83*** (0.08)	0.90*** (0.04)
Population	0.577*** (0.13)	0.24*** (0.09)	-0.49*** (0.08)	-0.10*** (0.03)	-0.07 (0.07)	0.10*** (0.03)	-0.13 (0.08)	-0.04 (0.04)
Distance	-0.55*** (0.11)	-0.46*** (0.16)	-0.72*** (0.04)	-0.74*** (0.07)	-0.64*** (0.04)	-0.61*** (0.06)	-0.43*** (0.04)	-0.41*** (0.10)
Contig	0.84*** (0.22)	0.51* (0.28)	0.21* (0.11)	0.15 (0.19)	0.40*** (0.11)	0.56*** (0.17)	0.36*** (0.12)	0.65** (0.32)
Language	-0.22 (0.21)	0.12 (0.34)	0.07 (0.15)	0.54*** (0.17)	0.16 (0.14)	0.23 (0.16)	0.33*** (0.10)	0.20 (0.33)
Colony	0.86*** (0.27)	0.45 (0.44)	0.15 (0.13)	-0.7 (0.17)	0.38*** (0.10)	0.24* (0.14)	-0.01 (0.11)	-0.05 (0.17)
EU-EU	2.63*** (0.39)	1.17*** (0.35)	-0.23* (0.13)	-0.04 (0.12)	0.47*** (0.13)	0.05 (0.13)	1.05*** (0.17)	-0.07 (0.25)
EU-Non.EU	1.69*** (0.39)	0.02 (0.33)	-0.54*** (0.15)	-0.01 (0.12)	-0.03 (0.10)	-0.56*** (0.11)	0.30** (0.12)	-0.59*** (0.17)
Non.EU-EU	-0.81*** (0.28)	-0.51** (0.23)	0.05 (0.10)	-0.34** (0.10)	-0.52*** (0.09)	-0.47*** (0.08)	-0.24*** (0.08)	-0.52*** (0.13)
NAFTA-NAFTA	2.05*** (0.74)	0.95*** (0.36)	1.63*** (0.34)	-0.64 (0.43)	1.78*** (0.34)	-0.09 (0.32)	2.69*** (0.38)	-0.16 (0.71)
NAFTA-Non.NAFTA	1.41*** (0.35)	0.07 (0.44)	0.15 (0.20)	-0.11 (0.17)	-0.23 (0.17)	-1.21*** (0.13)	0.33 (0.21)	-1.07*** (0.19)
Non.NAFTA-NAFTA	-0.36 (0.43)	-0.47 (0.37)	0.95*** (0.20)	0.04 (0.18)	0.52*** (0.16)	0.11 (0.18)	0.72*** (0.17)	-0.01 (0.22)
ASEAN-ASEAN	3.08*** (0.74)	2.78*** (0.42)	2.48*** (0.30)	1.63*** (0.20)	1.27*** (0.29)	0.77*** (0.20)	4.14*** (0.26)	1.89*** (0.41)
ASEAN-Non.ASEAN	2.51*** (0.44)	3.01*** (0.39)	1.03*** (0.20)	0.63*** (0.18)	0.50*** (0.18)	-0.06 (0.13)	2.29*** (0.19)	0.68*** (0.24)
Non.ASEAN-ASEAN	0.94** (0.45)	-0.55 (0.36)	1.15*** (0.21)	0.72*** (0.12)	0.59*** (0.14)	0.64*** (0.16)	1.32*** (0.16)	0.72*** (0.22)
R-square	0.69	0.28	0.82	0.66	0.87	0.71	0.88	0.51
Log-likelihood	-4.557e+08	-1.100e+09	-4.161e+09	-8.931e+09	-4.250e+09	-7.945e+09	-1.183e+10	-3.496e+10
Observations	35164	35164	53111	53111	53764	53764	53952	53952
Percentage of zero	37.68		5.88		4.72		4.39	

Variables	8 -- Miscellaneous Manufactured. Arts		9 -- Commodities nes	
	FE PPML	PPML	FE PPML	PPML
GDP	1.01*** (0.08)	0.83*** (0.04)	2.34*** (0.21)	1.25*** (0.07)
Population	-0.33*** (0.09)	0.04 (0.05)	-1.42*** (0.19)	-0.48*** (0.06)
Distance	-0.49*** (0.05)	-0.52*** (0.09)	-0.48*** (0.10)	-0.46*** (0.16)
Contig	0.41*** (0.11)	0.69*** (0.014)	0.50*** (0.16)	0.27 (0.34)
Language	0.40*** (0.12)	0.38 (0.25)	-0.17 (0.19)	0.62*** (0.23)
Colony	0.29** (0.13)	-0.03 (0.18)	0.90*** (0.23)	0.54** (0.25)
EU-EU	-0.23 (0.16)	-0.24 (0.20)	-0.88*** (0.30)	-0.90*** (0.29)
EU-Non.EU	-0.80*** (0.18)	-0.77*** (0.17)	-1.01 (0.63)	-0.79*** (0.30)
Non.EU-EU	-0.23** (0.11)	-0.14 (0.13)	-0.99*** (0.15)	-0.92*** (0.19)
NAFTA-NAFTA	1.25*** (0.41)	-0.92 (0.69)	-2.02** (0.83)	-0.92 (0.56)
NAFTA-Non.NAFTA	-0.49** (0.23)	-1.13*** (0.19)	-0.97** (0.45)	-0.10 (0.23)
Non.NAFTA-NAFTA	0.68*** (0.19)	0.30 (0.29)	-1.77** (0.37)	-1.32*** (0.26)
ASEAN-ASEAN	1.33*** (0.29)	0.72* (0.37)	3.43*** (0.45)	2.15*** (0.35)
ASEAN-Non.ASEAN	0.72*** (0.21)	0.43** (0.21)	1.67*** (0.45)	1.19*** (0.29)
Non.ASEAN-ASEAN	-0.41 (0.25)	0.26 (0.22)	1.49*** (0.25)	0.87*** (0.25)
R-square	0.89	0.45	0.48	0.31
Log-likelihood	-4.412e+09	-1.155e+10	-4.335e+09	-7.465e+09
Observations	54185	54185	42066	42066
Percentage of zero	3.97		25.45	

FE-PPML indicates the results of exporters, importers, and year fixed effect Poisson Pseudo Maximum Likelihood, whereas PPML indicates the results without the fixed effect.

Values in brackets, next to the coefficients, are the robust standard error. The ***, **, and * reflect the statistical significance of the variable at 1%, 5%, and 10%, respectively.

GDP and population represent the product of trading partners' GDP and population, respectively.

The number along with the industry's name indicates the SITC code of each industry. nes= Not elsewhere classified

6. Conclusion

The literature to measure the trade effects of the regional trade agreements (RTAs) intensified after the wave of regionalization in the 1990s. It is generally believed that the regional trade agreements introduce distortion as they favour the inefficient RTA members (in terms of productivity) over the efficient non-RTA countries. Most of the literature on trade creation and diversion suffers from a few problems, such as ignoring the endogeneity of the RTA variable, dropping the zero trade flows, employing the aggregate trade flow data, and ignoring the multilateral trade resistance.

The recent literature criticizes the studies that use aggregate trade flows data to assess the impact of RTAs because the tariff elimination/reduction effect may differ for different products. Our study disaggregates the trade data by products and estimates the gravity equation for each industry along with the aggregate trade flows. We use panel data of fifty-five countries over the period of 2000-2018 and analyze the EU, NAFTA, and ASEAN trade effects. This study also addresses zero-trade flows, endogeneity and multilateral trade resistance and uses the fixed-effect PPML technique proposed and developed by Silva and Tenreyro (2006). The study finds trade creation for all the selected RTAs using their aggregate trade flows. To study the trade impacts of these RTAs in detail, we do a disaggregated analysis. The industry-level analyses confirm trade creation in 60% of the EU's industries, whereas 40% reflect trade diversion. The results confirm trade creation in 80% of NAFTA's industries, whereas trade creation is found in all ASEAN's industries. Furthermore, the study also finds a significant impact of the other gravity variables on the trade flows. The GDP and population of both countries significantly determine their bilateral trade. The distance, proxied for the trade cost, possesses a negative sign and significantly affects the aggregate and the disaggregated trade flows. Based on the study's findings, we recommend that the countries should increase their bilateral trade to enhance the welfare impact of trade. For this purpose, the countries should reduce not only their intra-regional trade barriers but also the trade barriers with the rest of the world.

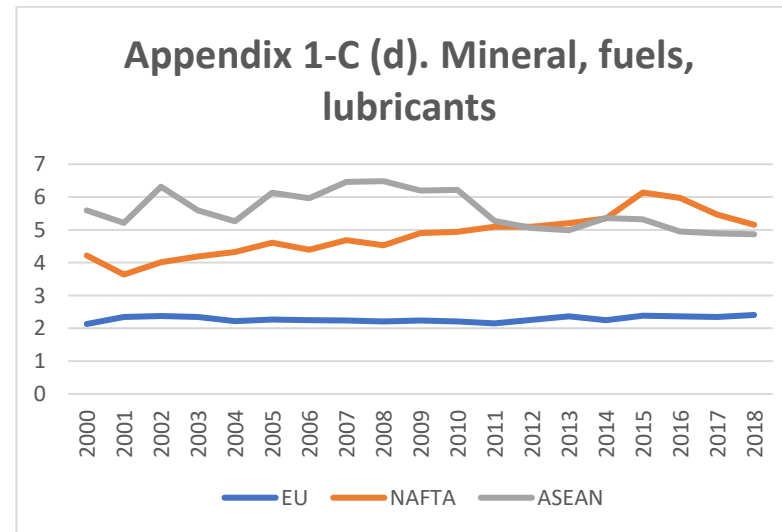
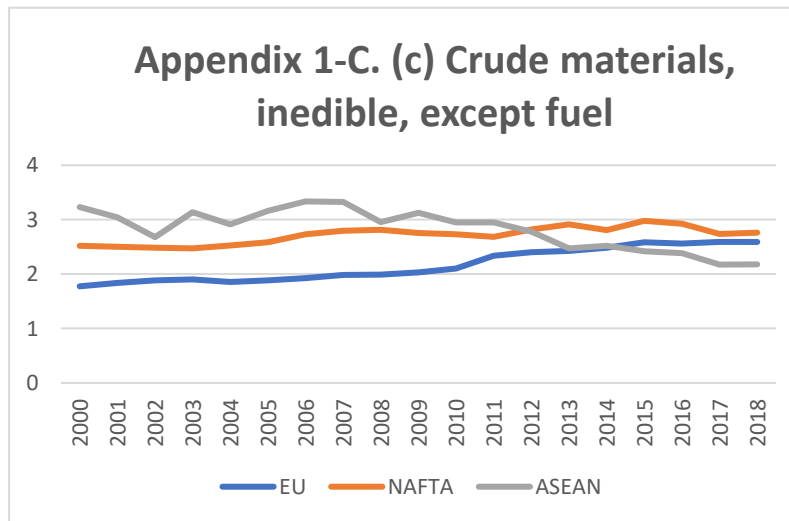
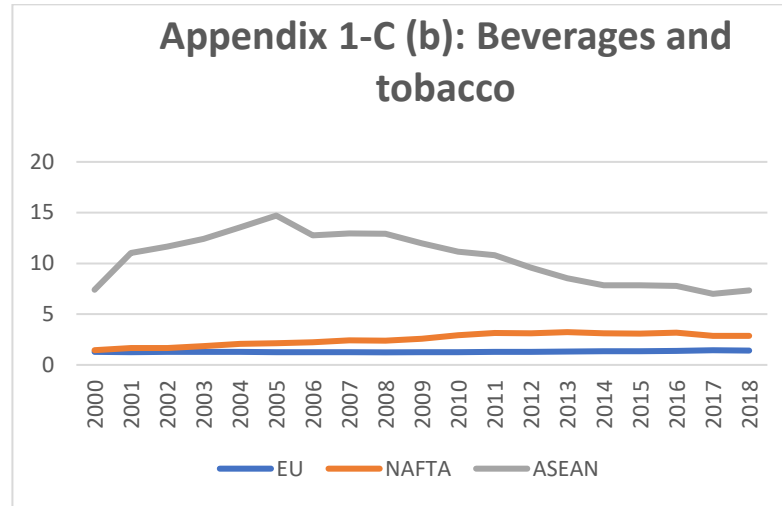
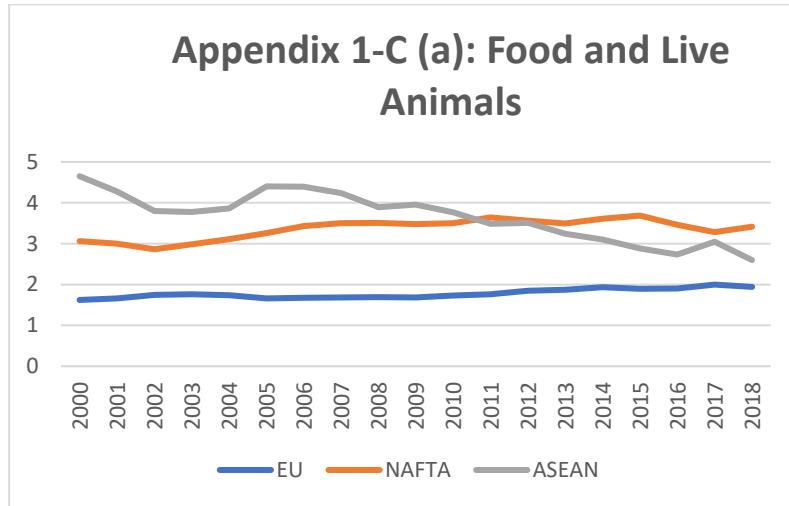
Appendix 1-A: The list of sample countries.

Argentina	Greece	Netherland	Turkey
Australia	Hong Kong	Norway	United Kingdom
Austria	Hungry	Pakistan	united states
Belgium	Iceland	Philippines	Vietnam
Belize	India	Poland	
Bulgaria	Indonesia	Portugal	
Canada	Ireland	Romania	
China	Italy	Saudi Arabia	
Costa Rica	Japan	Singapore	
Croatia	Korea	Slovak Republic	
Cyprus	Latvia	Slovenia	
Czech Republic	Lithuania	South Africa	
Denmark	Luxembourg	Spain	
Estonia	Malaysia	Sweden	
Finland	Malta	Switzerland	
France	Mexico	Thailand	
Germany	Morocco	Tunisia	

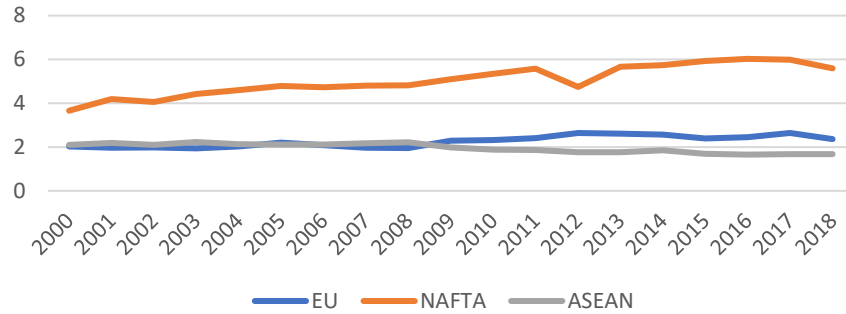
Appendix 1-B: 1-Digit industries used in the study.

SITC----- Industry
0 ----- Food and live animals
1 -- ----- Beverages and tobacco
2 -- ----- Crude materials. Except food/fuel
3 -- ----- Mineral fuel/lubricants
4 -- ----- Animal/veg oil/fat/wax
5 -- ----- Chemicals/products n.e.s
6 -- ----- Manufactured goods
7 -- ----- Machinery/transport equipment
8 ----- Miscellaneous manufacture
9 -- ----- Commodities nes

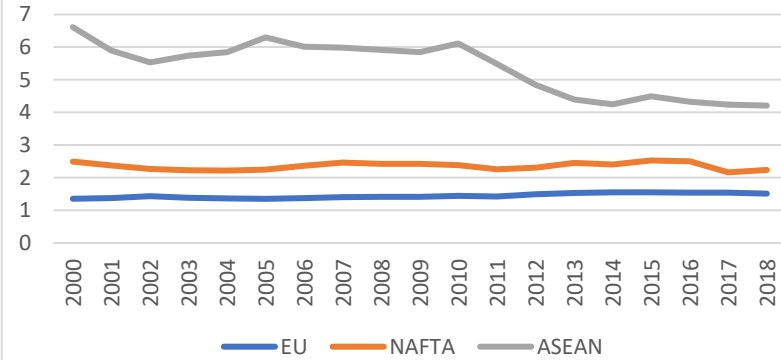
Appendix 1-C (a-j): Export intensity index of each industry



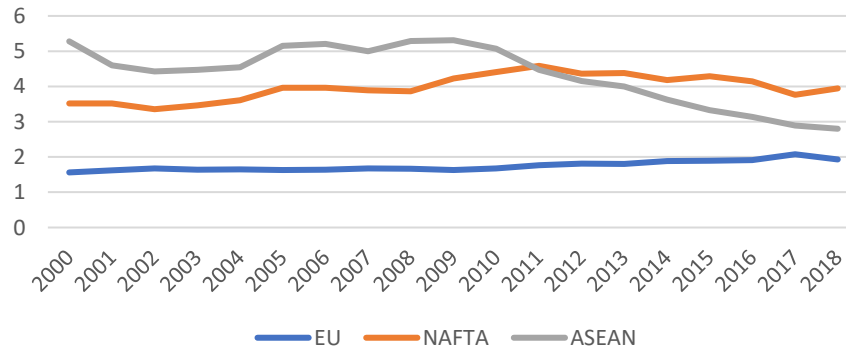
Appendix 1-C (e). Animal and vegetable oils and fats



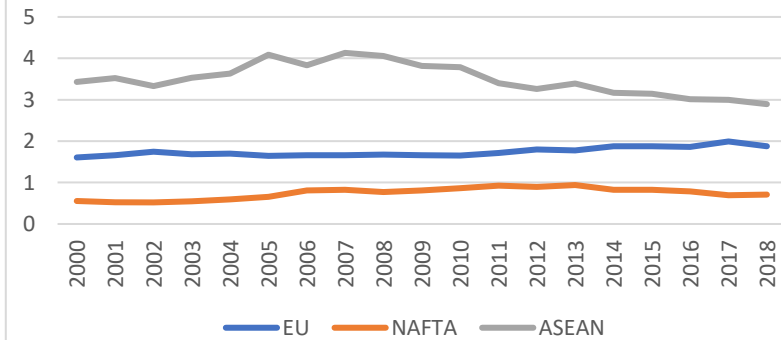
Appendix 1-C (f). Chemicals



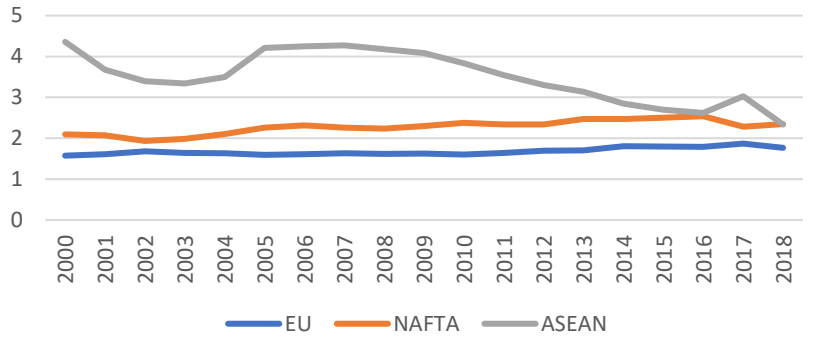
Appendix 1-C (g). Manufact goods classified



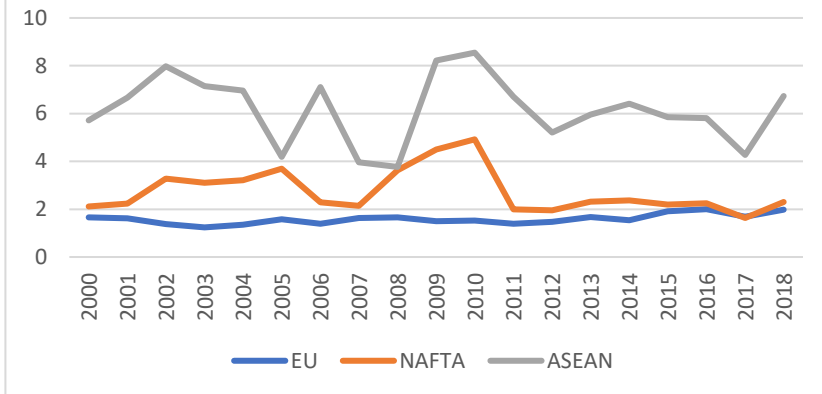
Appendix 1-C (h). Machinery and transport equipment



Appendix 1-C (i). Miscellaneous manufactured articles



Appendix 1-C (j). Commodity & Transactions. Not classified



Chapter 2

The nexus between trade integration and business cycle synchronization: The role of value-added trade in East Asia.

1. Introduction

A monetary union refers to an economic system of two or more countries that introduces a single currency and a single monetary policy through a common central bank. The Euro area, the most popular and effective monetary union, currently consists of 19 countries. The foundation of the Eurozone attracts researchers' attention to possible monetary unions in the rest of the world. In particular, most of the former literature focuses on the feasibility of the Optimum Currency Area (OCA) in East Asia (e.g., see Chow and Kim, 2003; Zang et al., 2004; Sharma and Mishra, 2012). The arguments in favor of a monetary union in East Asia are given: (1) East Asia countries are more open; (2) East Asia already has trade blocks, and intra-regional trade is highly intensified (Goto and Hamada, 1994); (3) the foreign direct investment (FDI) is high in the region (Kohsaka, 1996); (4) the shock adjustment mechanism is relatively faster and seems more rapid than in Europe (Eichengreen and Bayoumi, 1996). These researchers, on the basis of the above attributes, suggest a monetary union for East Asia and believe that its benefit will exceed the cost of forgoing independent monetary policy. Another argument for the formation of a monetary union in East Asia is the financial crisis of 1997, in which Malaysia, Indonesia, South Korea, and Thailand were badly affected, while China, Hong Kong, Japan, Singapore, and Taiwan were less affected. After the crises, it was observed that the devaluation of a common currency or basket of currencies could be used as a precautionary measure for the forthcoming crisis in East Asia.

A monetary union with a single monetary policy may decrease the operational cost of trade, increase the reliability of anti-inflation policies, and reduce the possibility of forthcoming financial crises. Given the pros and cons of joining a monetary union, the Optimum Currency Area theory sets different criteria that member countries should fulfill prior to joining a union. These include price flexibility and the free labor movement, the similarity of business cycles and shocks, trade intensity, and fiscal integration.³⁸ Fulfilling these conditions decreases the exchange rate adjustment demand because it introduces a self-adjustment mechanism. In the

³⁸ For details, the details and criteria of Optimum Currency Area (OCA) are given in section two.

above criteria, trade intensity and business cycle synchronization are considered the most important ones. It means that it would be optimal for countries to form a monetary union if they have high trade intensity and a synchronized business cycle. However, Frankel and Rose (1998) present the endogeneity of OCA criteria and believe that forming a currency union may fit the member countries better in OCA criteria ex-post even if they do not satisfy ex-ante. They say that there may be low trade volume between the countries which can be improved through the formation of a monetary union.³⁹ Furthermore, the income correlation among the potential member states can't be considered independent of trade integration. The high trade integration among the member states increases the business cycle synchronisation. More precisely, the endogeneity theory of optimum currency area describes that the formation/joining of a currency union decreases the chances of asymmetric shocks among the member countries and reduces the need for country-specific and sovereign monetary policy.

Our research study focuses on the endogenous theory of the optimum currency area of Frankel and Rose (1998) and analyzes the feasibility of a monetary union in East Asia and ASEAN.

1.1. Trade intensity and business cycle synchronization

Globalization in recent years has increased so rapidly that it is essential to determine the external aspects causing the variation in the domestic economy. The interdependence between the economies is increasing, and the recession/ boom in one country affects the rest of the region. International trade plays a vital part in the transmission of business cycles across countries. However, the business cycle's co-movements are subject to the nature of trade, and the increase in bilateral trade doesn't always need to induce harmonization of the business cycle across countries. For example, Krugman (1993) argues that trade between two countries mostly occurs on the basis of comparative advantage and an industry-specific shock leads to an increased gap between the business cycles of these trading partners. On the other hand, Frankel and Rose (1998) disagree with the above view and demonstrate that intensified trade between countries leads to more synchronized business cycles if the trade is dominated by intra-industry trade.⁴⁰ Subsequent to the seminal paper of Frankel and Rose (1998), several studies (e.g., Shin

³⁹ The historical data of European countries shows that they trade more than the past and the trend may continue.

⁴⁰ Mundell (1961) lays the foundation of optimum currency area (OCA) and consider co-movements of business cycle as an important and pre-requisite criterion for the formation of the optimum currency area. However, Frankel and Rose (1998) present the endogenous theory of OCA and believe that the monetary integration does not force for prerequisites, rather it is endogenous. For further details, please see the details in the second section in which we give the history and theoretical foundation of Optimum Currency Area (OCA) theory.

and Wang, 2003; Inklaar et al., 2008; Eggoh and Belhadj, 2015) empirically examine the association between trade intensity and business cycle correlation and find that the co-movement of business cycles increases with trade. However, the previous studies suffer from a common problem of measuring the trade intensity using the gross term instead of value-added. The gross trade data gives a distorted picture as the trade of intermediate goods accounts for two-thirds of total trade (Johnson and Noguera, 2012). In a region that has a significant share in value-added trade, such as East Asia, the use of gross trade data would be meaningless and misguided.⁴¹ Due to the rapidly increasing importance of the global supply chain, East Asia emerged as the second-largest region and contributed 27.9% to the total value-added trade of the world in 2015, as shown in Figure 2.1.⁴² To accurately capture the association between trade intensity and business cycle synchronization in East Asia and ASEAN, we focus on trade data in value-added and test the Frankel and Rose (1998) hypothesis.

Recent studies (e.g., Duval et al., 2016; Jiang, 2019) show that it's the value-added trade that drives the business cycle synchronization rather than the gross trade. The rationality why the business cycle moves with value-added trade is because of the fact that it is value-added exports that contribute to the GDP of a country instead of gross exports. Due to the global supply chain, the products cross borders several times in the form of intermediate products.⁴³ As the gross trade count trade statistics at each border instead of the net value-added, the conventional trade data exaggerate exports' domestic content due to the double counting.

⁴¹ See the figure 2-2, which indicates the shares possess by different region in world gross exports. We can see that the East Asia possess a high exports share of 32% in world gross exports. While comparing this gross export share with the value-added export shares of East Asia (figure 2-1), we see that East Asia gross exports is overvalued. In such case, the use of gross trade data may be inaccurate and misleading.

⁴² The intermediate inputs are exported to East Asia for assembling, and then exported to the North America and Europe as a final product (Jiang et al. 2019).

⁴³ In supply chain, each manufacturer buys a product (raw material etc) and then contribute to its value. The value added is the price paid to the factor of production in each exporting country.

Figure 2.1: Share in world value-added exports by region 2005-2015

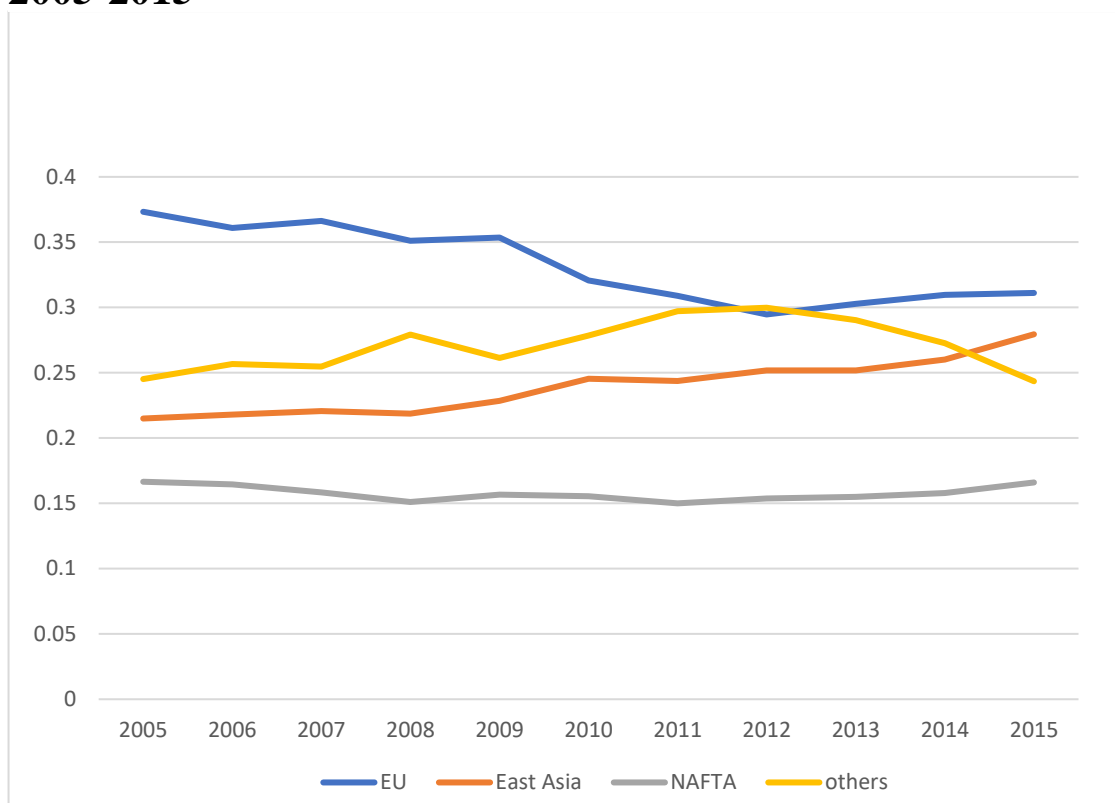


Figure 2-1 reflects world value added exports share of different regions. The EU shows the value-added share of EU 28, East Asia shows the shares of 10 East Asia's countries, whereas NAFTA indicate the share of the US, Canada, and Mexico in world value added exports. The world refers to 64 countries given in 2018 release of OECD database. The others indicate the share of the remaining 20 countries. The shares are based on authors' calculation.

Apart from the double-counting issue, a multi-country production function may exist, which means that the intermediate goods can take an indirect route to reach their final destination. For example, if Japan's intermediate goods are shipped to China for assembly and then exported to the US as final goods, then China's exports consist of third-country value-added content. The iPhone supply chain is the most cited example to explain the importance of the third country and value-added trade. China receives components from different countries for assembling and re-export them to the US. In such a case, the gross exports massively surpass the Chinese producers' value and overestimate the potential GDP growth due to the demand

shock coming from the United States. However, in other countries that possess a value-added share in the production of the iPhone, the potential GDP growth will be underestimated as the gross trade is zero.⁴⁴ Both the double-counting and the multi-country production network mean that there is a hidden structure of the value-added in given gross trade flows (Xing and Detert, 2010).

The gross exports, which are made up of value-added exports, don't depict a clear picture of where these exports are ultimately consumed. In light of the above discussion, we conclude that the studies that try to explore the nexus between trade intensity and co-movement of business cycle based on gross trade provide inaccurate and misleading results.

This section aims to explore the association between intra-regional trade and business cycle synchronization by focusing on value-added trade in East Asia countries. In this section, we derive the value-added trade data from the 2018 release OECD database that not only excludes the double-counting in gross trade but also measures the indirect trade between the two countries. As clear from figure 2.1, East Asia possesses a high share in world value-added exports. The 21% shares in 2005 reached 28% in 2015.⁴⁵ Due to the lowering and eliminating tariffs that started in the 1980s, the intra-regional trade in East Asia enhanced faster than any other region in the world. This rapid integration raises the importance of investigating the relationship of increased trade with the business cycle synchronization in East Asia and ASEAN (Rana 2008). Furthermore, East Asia also intensifies intra-regional trade by reducing trade barriers through the formation of the Association of Southeast Asian Nations (ASEAN) and the Asia Pacific Economic Cooperation forum (APEC).⁴⁶ Due to these reasons, we not only focus on East Asia but also on ASEAN.⁴⁷ For this purpose, we separate ASEAN's data from the rest of East Asia's countries and explore the nexus between the value-added trade intensity and co-movements of the business cycle. The intuition behind this is because of the rise in ASEAN's intra-regional trade since its establishment.⁴⁸ This analysis has an important

⁴⁴ Xing and Detert (2010) explain the production process of iPhone in different countries. They explain that China gross trade reveals over-estimated figure as it possesses only 3.6% value added share in the production, whereas the rest is received by Korea, Japan, the US and Germany.

⁴⁵ Whereas East Asia possesses 32% shares in world gross export. This indicates the importance of value-added trade in East Asia.

⁴⁶ Please see the figure 2-A, which indicates the intra-regional exports share of East Asia. The East Asia possess high intra-regional value-added exports over the given period.

⁴⁷ We select 10 East Asia countries in our sample, i.e., China, Hong Kong, Japan, Korea, Indonesia, Malaysia, Philippines, Thailand, Singapore, and Vietnam. The countries' selection is based on data availability.

⁴⁸ See Appendix 2-B, which reflects the share of intra-ASEAN value added exports. We see a highly intensified intra-region value-added export in ASEAN. In 2015, the ASEAN possess 43% of intra-regional shares in their total value-added trade.

implication for analyzing the costs and benefits of holding a common currency to remove the risk related to the exchange rate fluctuation in East Asia and ASEAN.

Apart from the Frankel and Rose (1998) hypothesis, we also focus on the other determinants of business cycle synchronization. These factors include intra-industry trade, financial integration, the similarity in the economic structure, the volatility of exchange rate, and the policy coordination in the region's countries. In ASEAN and East Asia, the literature mostly focuses on the traditional determinants of business cycle synchronization and ignores regional policy coordination and exchange rate fluctuations. Therefore, we fill this gap and include variables for the exchange rate volatility, and fiscal and monetary policy coordination.

Figure 2.2: Shares of different regions in the world's gross exports.

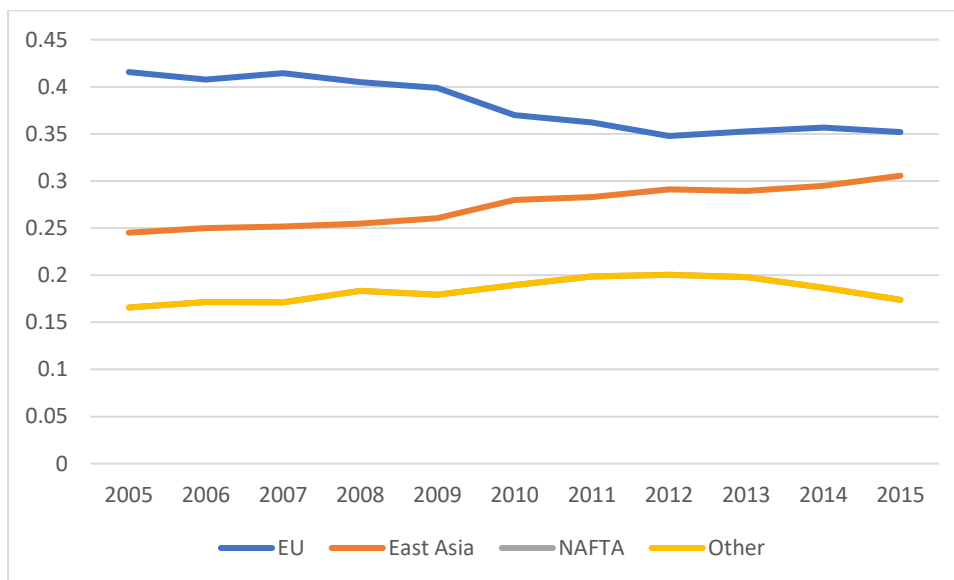


Figure 2-2 indicates the shares possess by different region in worlds gross exports. The graph reflect a decrease of EU shares in world gross exports. The share of EU decreases from 41% in 2005 to 36% in 2015. This decline is not only seen in gross export share, but the value-added export share in world also observe a decline. Similarly, NAFTA shares in world gross exports indicate a slight decrease over time. The 18% share in world gross export in 2005 decrease to 17% in 2015. Contrary to the EU and NAFTA, the East Asia get a significance shares of world gross exports. The East Asia increase its shares from 24% in 2005 to 32% in 2015. This also indicates that East Asia's export possesses

1.2. Organization of the section

Apart from this introductory part, the remaining section is ordered as follows. The second segment consists of the theoretical background and explains different criteria of the

Optimum Currency Area (OCA) theory. The literature review and the determinants of the business cycle are given in sub-section three. The methodology, data, variables construction, and data sources are defined in the fourth sub-section. Sub-sections five and six describe the results and the conclusion of this section, respectively.

2. Theoretical background and empirical literature on Optimum Currency Area (OCA) theory

In this section, we present the theoretical background and empirical studies. The first part discusses the background and different criteria associated with the Optimum Currency Area (OCA). In this first part, we discuss the traditional OCA theories and Frankel and Rose (1998) endogenous theory of OCA. The second part of this section is reserved for the empirical literature.

2.1. The theoretical background of Optimum Currency Area (OCA) Theory

The countries joined a Bretton Wood system and fixed their exchange rate against the US dollar in 1944. However, Friedman (1953) strongly opposes the adoption of a fixed exchange rate and participates in the pros and cons discussion of the fixed exchange rate. He argues that a fixed exchange rate does not address the balance of payment problem and deteriorates it further. In such a case, the adoption of a flexible exchange rate would be beneficial because of its adjustment mechanism to address the balance of payment problem in light of variations in aggregate demand. He further demonstrates that the fixed exchange rate is reluctant to international trade, whereas a flexible exchange rate promotes international trade and creates wealth by labor division. Friedman's work favoring a flexible exchange rate played a vital role in analyzing the advantages and disadvantages of an Optimum Currency Area (OCA). However, some researchers strongly oppose this view of Friedman and believe that the cost of adopting a flexible exchange regime is greater than its benefit. These researchers advocate adopting a fixed exchange rate and put the foundation of an Optimum Currency Area (OCA) theory. We discuss each of them in detail in the following section.

2.1.1. Robert Mundell: The founder of the Optimum Currency Area (OCA) theory

The literature on optimum currency area starts with Robert Mundell's work when he wrote and published his paper "A Theory of Optimum Currency Areas" in 1961. He disagrees with Friedman's view of flexible exchange rate and explains the criteria and conditions for when countries/regions should make a currency union and adopt a fixed exchange rate for the region and flexible for the remaining world. He starts by expressing an optimum currency area (OCA) as a region for a single currency with high integration regarding goods and services,

assets, labor, and capital mobility. Before joining a currency union, countries need to know the costs and benefits of an optimum currency area. Mundell suggests a currency union for the countries if benefits exceed the costs of joining a union. The formation of a currency area reduces uncertainty and transaction cost, whereas it highly introduces trade integration in the region.

Mundell suggests two main criteria to know the optimality of a monetary union. First, he emphasizes labor mobility and considers it one of the main characteristics of the optimum currency area. According to him, if there is free labor mobility in the region and a country faces a negative shock that results in a decline of output and an increase in unemployment, the labor can move to the other country of the region unaffected and has low unemployment. This indicates that a single monetary policy is sufficient for both countries, and there is no need to have their own exchange rates. Consequently, these countries can adopt a fixed exchange rate within their boundaries, but a flexible for the rest of the world. Second, he considers price and wage flexibility as primary criteria for the optimal currency area because they can address idiosyncratic demand shocks. For example, if wages are flexible and not sticky in the two countries model, unemployed labor in country A would migrate to country B, where there is a high demand for labor. This free mobility of labor eradicates the need to decrease country A's wages and increase country B and solve unemployment and inflationary pressure in countries A and B, respectively. In another paper, Mundell (1973) adds other factors to the existing criteria for creating an optimum currency area (OCA).

2.1.2. McKinnon's contribution to the OCA theory

MacKinnon (1963) contribution is considered a second significant contribution to the OCA theory. He focuses on the size of the economy and degree of openness and considers it as key criteria for OCA formation. He defines the degree of openness as a ratio of tradable to non-tradable goods and suggests a fixed exchange rate for a more open economy and flexible for a more closed economy.⁴⁹ The motive for this is that if the term of trade is high, i.e., a higher degree of trade openness in the economy, there will be a high probability of tradable goods price transmission to the domestic cost. The exchange rate will highly influence wages and prices in such a case. So, the exchange rate fluctuations will be less useful in adjustment mechanisms and less effective in varying the terms of trade.

⁴⁹ He defines tradeable as a goods that can be exported to foreign, whereas non-tradeable can't be exported due to some restriction, i.e., high transportation cost etc.

The fundamental point of McKinnon's analysis is that it will be beneficial for an open economy to adopt a fixed exchange rate system. Furthermore, he suggests that open economies with high bilateral trade intensity should make a monetary union as the efficiency gain (protecting the volatility in the exchange rate) would exceed the cost of joining a monetary union.

2.1.3. Kenen's contribution to the OCA theory

Peter Kenen is the third main contributor to the optimum currency area (OCA). Kenen (1969) analyses the impact of shocks on a specific export industry and contributes to the OCA in three ways. First, he focuses on fiscal integration and considers it one of the main criteria for knowing optimality. If there is high fiscal integration between two regions, the asymmetric shock can be addressed by fiscal transfer to high unemployment region from a low unemployment region. Second, he emphasizes labor mobility and production structure. He stresses that a monetary union is suitable for the countries if they have similar production structures and high labor mobility. In such circumstances, the sector-specific shock is probably to affect them symmetrically. Third, he points out that the perfect mobility of labor seldom exists. So, product diversification should also be used to examine whether a country should adopt a flexible or fixed exchange rate. For instance, a less diversified country that produces and exports a single product is hit by a negative demand shock, resulting in a decline in exports. Under a fixed exchange regime, the country faces a reduction in export revenue because it does not have the option of depreciation. So, a drop in exports could reduce prices and wages, increasing unemployment under a fixed exchange rate. However, this reduction in exports can be addressed by a flexible exchange rate, and depreciation of currency would take place due to the fall in demand for domestic currency. On the other hand, a highly diversified economy faces a negative demand shock in one industry and a positive shock in another industry. These shocks will be offset by each other due to high diversification, and there will be no need to alter terms of trade through changes in the exchange rate. Hence, Kenen believes that a fixed exchange regime (currency area) is suitable for countries with diversified economies and a flexible regime for less diversified economies.

Although the contribution of Mundell (1961), McKinnon (1963), and Kenen (1969) are considered an important contribution to the optimum currency area (OCA) theory, other studies also contribute to the OCA theory in one way or another. For example, Corden (1972) believes that a country loses its direct control over the exchange rate and monetary policy once it joins

a currency union. So, if a negative demand shock hits a country, it will not be able to adjust the relative prices and wages through monetary policy. In such a situation, adjustments can be made through increased unemployment, relative prices and wage reduction, or fiscal policy. Hence, Corden concludes that a country should consider the flexibility of wages and relative prices before joining a common currency area because they react faster to idiosyncratic shocks. Furthermore, he posits that creating a currency union can be harmful if different inflation-targeting policies exist among the countries. Similarly, Ishiyama (1975) considers the increase in wage and inflation rate differences as precondition criteria for joining a currency area.

Summing up, these researchers contribute tremendously to the theory of optimum currency area (OCA) and analyze the cost and benefit of joining a monetary union. Mundell focuses on labor mobility, price flexibility, financial integration, and symmetric shock; McKinnon (1963) considers trade openness and the size of the economy, whereas Kenen (1969) emphasizes the diversity of export and fiscal integration as the main criteria of optimum currency area (OCA).

2.1.4. Development in optimum currency area theory in the 1990s

After the foundation of the optimum currency area (OCA) theory and a little research in the 1960s and 1970s, we see a slowdown in research regarding the OCA theory. But after the formation of the European Monetary Union (EMU) in the 1990s, we see a rebirth of the optimum currency area (OCA) as many researchers again pay attention to the theory of OCA. The main reason behind this rapid expansion is to find out whether the European Union fulfils the optimum currency area criteria. In addition, Tavlas (1993) believes that macro theory development is also a reason to catch the researchers' attraction to the OCA theory. According to him, the OCA theory should be revisited following the new development in macroeconomic theory. De Grauwe (1992) calls this rapid expansion in OCA research "the new theory of OCA."

Instead of focusing on the traditional factors mentioned in the OCA theory, these researchers focus on other determinants that need to be studied before joining a monetary union. These factors include synchronization of the business cycle, coordination of monetary policy, the convergence of economies, correlation in shocks and studying its possible effects on an economy, specialization and trade pattern etc.

2.1.5. The endogeneity of the optimum currency area

As explained in the traditional theory of optimum currency area (OCA), an area should be optimal before joining a monetary union and a fixed exchange rate regime. However, Mundell (1973a, 1973b) reverses his own pre-requisite of traditional theory since he believes that adopting the fixed exchange rate and forming a monetary union introduces optimality in an economic area. In a traditional view, he describes that asymmetric shocks worsen the case of a monetary union. In contrast, Mundell (1973b) shows how a single currency deals with such shocks through better portfolio diversification and reserve pooling. In a monetary union, an economy facing such shock can share its loss with the other monetary union members as they claim the output of each other.

Frankel and Rose (1998), using the perception of Mundell (1973), present the endogenous theory of the Optimum Currency Area. According to them, monetary union formation decreases transaction costs, removes exchange rate fluctuations, eliminates market segmentation, and introduces price competition. In other words, the monetary union encourages bilateral trade, financial and economic integration and build-up knowledge (De Grauwe and Mongelli, 2005).

Frankel and Rose (1998) explain that the high trade within a monetary union enhances the business cycle synchronisation among the members' states. According to them, a country may fulfill the OCA criteria ex-post even if it does not ex-ante and called this theory endogeneity of optimum currency area. More precisely, this theory discards the former research's focus on studying the symmetric shocks among the countries as a pre-condition for a probable member in a currency union. The endogenous theory of optimum currency area describes that the formation/joining of a currency union decreases the chances of asymmetric shocks among the members' countries and reduces the need for country-specific and sovereign monetary policy. However, Krugman (1993) believes that the high trade among the member states of a monetary union leads to a specialization effect between the countries in which they have a comparative advantage.⁵⁰ In line with the standard theories of trade, he describes that the more open economies could get more specialization in the goods in which they have a comparative advantage, leading to increased inter-industry trade in the region. In such a case, the industry-specific shock could increase the gap between the trading partner's business cycles

⁵⁰ The standard theories of trade describe that the more open economies could get more production specialization in the products in which they have comparative advantage, leads to increase the inter-industry trade in the region.

and the relationship of trade intensity and the business cycle may go in a negative direction. However, Frankel and Rose (1998) do not agree with the above view and explain that regionalization leads to enhances intra-industry trade. So, if the intra-industry trade is dominant, the increase in trade enhances the business cycle synchronization in the region.

2.1.6. Extension of endogenous theory of OCA

Apart from bilateral trade intensity, there are other factors that are also considered important to promote business cycle synchronization in the literature. We discuss these factors in the following section.

2.1.6.1. Fiscal policy and business cycle synchronization

Fiscal policy convergence, along with trade and financial integration, plays a vital role in the synchronization of the business cycle. Therefore, it is also considered one of the main criteria of the optimal currency area.⁵¹ However, the interlink between these two is lacking in the theoretical foundation. The economies may experience asymmetric shocks, along with symmetric shocks, that can generate asymmetric effects due to different economic structures. For example, fiscal policy divergence induces a high degree of synchronization of the business cycle if it successfully deals with these shocks through the automatic stabilizer and discretionary fiscal policy. On the other hand, fiscal policy divergence may have a negative impact on business cycle synchronization (BCS) if it produces a more significant demand-side effect (Darvas, Rose and Szapary, 2005).

As the link between fiscal policy convergence and business cycle synchronization is not well established, some economists see it doubtfully as the traditional Optimum Currency Area (OCA) theory does not ask for this criterion. However, a theoretical connection between fiscal policy convergence and business cycle synchronization can be developed. The fiscally irresponsible countries, i.e., countries having a high budget deficit to GDP ratio, generate an asymmetric fiscal shock. In such a case, countries make reforms and reduce their budget deficit to GDP ratio. This, in turn, reduces the chances of asymmetric fiscal effect and increases the synchronization of its business cycle with other countries. In other words, the convergence of fiscal policy induces co-movements of the business cycle as the responsible fiscal actions are

⁵¹ The twelve European countries signed a Maastricht Treaty in 1992 and set certain convergence criteria that countries must fulfil prior to joining the currency union. These criteria include government budget, public debt, exchange rate and inflation. Similarly, the stability and Growth Pact (SGP) also highlights the importance of fiscal policy.

likely to be less idiosyncratic (Nzimande and Ngalawa, 2017). The empirical studies also find that fiscal policy convergence leads to business cycle synchronisation (for example, Clark and van Wincoop, 2001; Shin and Wang, 2005; Crespo-Cuaresma et al., 2011; Hauge and Skulevold, 2012; Nzimande and Ngalawa, 2017).

The role of fiscal policy convergence in the transmission of business cycle synchronization in the European Union (EU) context has been discussed widely in the literature. However, only a few studies explore the impact of macroeconomic policies, especially fiscal policy, on the business cycle synchronization across the region. East Asia has successfully enhanced integration and regionalization in the last four decades. In order to increase the trade, investment, monetary and financial collaboration in the region, several agreements have been signed, such as the Association of South-East Asian Nations (ASEAN), Asia Pacific Trade Agreement (APTA), East Asia free trade agreement etc. As a consequence of the Asian financial crises, the region's countries agreed to adopt closer macroeconomic policies and increase financial cooperation in the region. So, there is a need to analyze and explore the role of these policies in the region. In order to fill this gap, we calculate the similarity index of government expenditure (percentage of GDP) and analyze the effect of fiscal policy on business cycle synchronization in East Asia and ASEAN. This type of study is essential to analyze the pros and cons of the currency union in East Asia and see whether the region fulfills the Maastricht criterion of convergence or not.

2.1.6.2. Monetary policy and business cycle synchronization

The view of monetary integration in Asia started after the financial crisis of 1997. It is generally believed that countries should adopt a common monetary policy through the formation of monetary unions if a uniform monetary policy suits them. The question of whether a common monetary policy is suitable for the region depends on the symmetry of macroeconomic variations. If the countries share symmetric macroeconomic variations, it would be beneficial for them to join a monetary/currency union and surrender their sovereign monetary.⁵² Most of the literature investigates business cycle synchronization to measure the symmetry of macroeconomic variations in the region. Several factors, along with trade intensity, contribute to and drive the synchronization of business cycles in the region. These

⁵² This is believed to be a pre-requisite criterion for the formation of Optimum Currency Area (Mundell, 1961; McKinnon, 1963).

factors include financial integration, monetary and fiscal policies coordination, similarity in economic structure etc. (Shin and Wang, 2007; Rana, 2007).

The coordination of monetary policy among the countries generates the synchronization of the business cycle in the region. The monetary policy is one of the key sources of the business cycle, and it is expected that a similar monetary policy of the countries would affect and react to their business cycles in a similar way, i.e., increase the synchronization of the business cycle. In East Asia, monetary policy coordination (co-movements of interest rate) drives and determines business cycle synchronization (Rana, 2007; Sethapramote, 2015)⁵³. The finance ministers and the central banks of East Asian countries meet and regularly organize policy discussions to enhance the region's policy coordination. This study analyzes the nexus of monetary policy coordination and business cycle synchronisation in East Asia.

2.1.6.3. Exchange rate volatility

The exchange rate volatility is also considered one of the determinants of business cycle synchronization. However, no theoretical backup explains a direct relationship between exchange rate and business cycle synchronization. But there are indirect channels through which a relationship between these two can be established. For example, the Mundell-Fleming (1962, 1963) model explains that the country should adopt a convergent monetary policy (fixing the exchange rate) with the anchor country's monetary policy in an open economy. As the literature finds monetary integration as a driver of business cycle synchronization, we expect a less volatile exchange rate to produce a more synchronized business cycle. Thus, the Mundell-Fleming model gives us an insight and a possible channel of how exchange rate fluctuations affect business cycle synchronization. The less volatile exchange rate is expected to increase financial integration and bilateral trade (Klein and Shambaugh, 2006). Through these channels, the exchange rate variation is expected to indirectly affect the business cycle synchronization.⁵⁴

⁵³ However, a high volatility in the interest rate negatively affect business cycle synchronization (Otto et al. 2001).

⁵⁴ The East Asia countries have highly increased regional integration in recent decades, especially trade and foreign direct investment. The volume of intra-regional trade in East Asia is more than 50% of their total trade. This increasing economic interconnection in the East Asia region proposes a stable exchange rate. After the 1997 currency crisis in Asia, the policymaker raised the region's issue to enhance the exchange rate and monetary coordination. In turn, these integrations may increase the trade and investment in the region in a similar way, which could lead to a synchronized business cycle in the region. Along with the other determinants, it is necessary to examine the impact of exchange rate fluctuation on business cycle synchronization. For this purpose, we analyze the effect of exchange rate volatility on the business cycle synchronization in East Asia.

3. Literature review

Following the study of Frankel and Rose (1998), many studies explore the nexus between the trade intensity and synchronization of the business cycle. This section presents empirical studies that analyze the connection between business cycle synchronization and trade intensity.

Frankel and Rose (1998) observe the association between the trade linkage and co-movements of the business cycle employing twenty-one industrialized countries' data. Unlike Krugman (1993), they conclude that trade brings synchronization in the business cycle of the trading partners. Calderon et al. (2002) extend the study of Frankel and Rose (1998) to developing countries and explore whether the relationship holds the same. They employ the data of 147 countries and find that the relationship between trade intensity and business cycle synchronization is weaker in developing countries than in developed countries. Unlike previous studies focusing on specific countries, Loayza et al. (2001) examine the business cycle movements in Europe, East Asia, and Latin American countries and highlight the importance of sector-specific, country-specific, and common shock. They discover the stronger co-movements in Europe and East Asia but weaker ones in Latin America. Similarly, Imbs (2004) also explores the relationship among trade, business cycle correlation, sectoral specialization and financial integration using data of 24 developing and developed countries. He finds that the impact of trade on business cycle correlation is small once the role of intra-industry trade is ignored. Baxter and Kouparitsas (2005) also extend their efforts to analyze the business cycle's determinants by employing data from 100 developing and developed countries. They find a robust relationship between trade intensity and the co-movement of the business cycle.

Like Frankel and Rose (1998), Inklaar et al. (2007) re-analyze the connection between business cycle correlation and trade intensity by employing the data of 21 OECD countries. They also come up with a positive effect of trade intensity and monetary and fiscal policy on business cycle synchronization. However, they get much smaller coefficients than Frankel and Rose (1998) stated. The studies mentioned above employ several techniques to handle the issue of endogeneity; however, most of them ignore country pair heterogeneity. The country-pair heterogeneity can affect the business cycle synchronization if trade intensity varies within each country pair. For example, the trade intensity may be high if they share a common border, language etc., which affects both synchronization and trade connexions. For this purpose, Abiad et al. (2013) account for the country-pair heterogeneity and use quarterly data over the

period of 1978-2012 for sixty-three countries. They find a statistically insignificant nexus between trade integration and business cycle synchronization.

Although the above studies consider intra-industry trade as a main determinant of the business cycle synchronization, they do not include a variable for the intra-industry trade. The business cycle synchronization depends on the nature of trade: i.e., inter-industry and intra-industry trade. In the case of inter-industry trade, industry-specific shock leads to a specialization effect and reduces the synchronization of the business cycle in the region. However, if intra-industry trade is dominant in the region, it increases the business cycle synchronization. For this purpose, Fidrmuc and Fidrmuc (2003) include intra-industry trade explicitly in the model and employ the data of OECD countries. They conclude that intra-industry trade pushes the business cycle to move in the same direction rather than bilateral trade intensity. Similarly, Shin and Wang (2003) also criticize Frankel and Rose (1998) model for ignoring a specific variable for the intra-industry trade. Apart from a particular variable for intra-industry trade, they also take total trade intensity, fiscal, and monetary policy coordination and measure the relationship in twelve Asian economies. They also conclude that the major factor for the coherence of the business cycle is intra-industry trade. Extending their same approach to diagnosing the nexus in Europe, Shan and Wang (2005) find the same results as for East Asia. In order to search for the optimal currency area, Cortinhas (2007) explores the relationship between intra-industry trade and business cycle co-movement in the ASEAN countries. He finds that intra-industry trade positively affects business cycle co-movements in ASEAN. Rana et al. (2012) present a comparative viewpoint between the EU-15 and East Asia. They divide the data period into two samples, i.e., 1987-1996 and 1997-2007, and find that intra-industry trade is the main determinant of business cycle synchronization rather than inter-industry trade. Furthermore, they find a more substantial nexus between trade intensity and business cycle co-movements in East Asia than in Europe. Eggoh and Belhadj (2015) examine the impact of trade intensity and business cycle synchronization for the Maghreb countries. Their results indicate a positive effect of trade intensity on business cycle synchronization, although the magnitude is lower than in industrial countries. They find the same relationship even when they account for intra-industry trade, financial integration and economic diversification. On the other hand, Saiki (2018) emphasizes vertical and intra-industry trade and tries to find the influence of different types of trade on business cycle correlation in East Asia and Europe. He focuses on the manufacturing industry and finds that the business cycle synchronises over the period in both regions with the intra-industry and vertical trade. Similar to Rana et al. (2012), he also finds a more substantial impact in East Asia than in Europe.

The above-mentioned studies suffer from a common problem as they use gross trade instead of value-added trade data. In recent eras, products have crossed borders several times because of the increasing importance of the supply chain. In such a case, the gross trade data may reflect an overvalued term due to double counting. Therefore, to avoid this problem, Johnson (2014) stresses that intermediate inputs are the main cause of business cycle synchronization, and the traditional IRBC model does not differentiate between the intermediate inputs and final goods. He analyzes the impact of intermediate inputs and finds a highly synchronized business cycle for goods trade, but the co-movements were close to zero for services trade. Similarly, Duval et al. (2016) employ value-added trade data of 67 countries to analyze the connection between trade intensity and the synchronization of business cycles. Apart from the value-added trade, they also analyze the impact of trade specialization correlation, intra-industry trade, and vertical integration on business cycle correlation. They find a statistically significant and positive impact of trade intensity, based on value-added trade, on the business cycle synchronization. However, they find a positive but smaller impact of the other variables, such as trade specialization correlation and intra-industry trade, on business cycle harmonization. They argue that value-added trade brings synchronization in the business cycle of trading partners, and gross trade carries an insignificant impact once they account for the other determinants of business cycle synchronization. However, Jeon (2018) criticizes Duval et al. (2016) for their accounting and decomposing technique. He stresses that they don't properly decompose the gross trade and exclude the domestic value-added in intermediate exports that return via final imports and domestic value-added returns through intermediate imports. For the decomposition, Jeon (2018) follows Koopman et al. (2014), divides the trade data into different subcategories, and explores the relationship between value-added trade intensity and business cycle synchronization in East Asia and Europe. He finds a significant impact of trade intensity and intra-industry trade on business cycle synchronization in Europe. However, he does not find a clear picture of the relationship between trade intensity and the business cycle in East Asia. Similarly, Jiang et al. (2019) apply Duval et al. (2016) 's methodology and find a robust effect of value-added trade intensity on business cycle harmonization in East Asia. While measuring the intra-industry trade, they computed the index only for selected manufacturing industries, which is not appropriate. Furthermore, they concentrate only on the whole of East Asia and neglect the role of value-added trade in ASEAN separately. ASEAN is a region that has highly intensified its intra-regional trade through the reduction of tariffs by signing the trade agreement. Therefore, along with East Asia, it is

necessary to separately examine the effect of value-added trade intensity on the business cycle in ASEAN to analyze the cost and benefit of adopting a common currency in the region.

In light of the literature and the growing importance of the supply chain, we can conclude that the use of gross trade data is inappropriate in such a type of analysis. Therefore, we use value-added-trade data and analyze the nexus between trade intensity and business cycles in selected ASEAN and East Asia countries. Apart from using the trade intensity in the value-added term, there is a need to assess the impact of policy coordination and exchange rate volatility on business cycle synchronization. This analysis enables us to see the optimality of the currency union in East Asia and ASEAN. Most of the literature ignores these variables and just focuses on trade and some other factors. Therefore, we fill this gap and explore the impact of monetary and fiscal policy coordination and exchange rate volatility on business cycle synchronization.

4. Methodology and data

This section presents variables construction/derivation, data, and estimation methodology. In the first part of this section, we construct different variables that we need for our analyses. The data and descriptive statistics are given in the second part. The third part presents the methodology we use to explore the impact of trade intensity, policy variables and other important variables on business cycle synchronization.

The key objective of this research work is to analyze the endogenous hypothesis of optimum currency area introduced by Frankel and Rose (1998). For this purpose, we try to explore the nexus between the business cycle and trade intensity in East Asia and ASEAN by concentrating on value-added trade. Apart from the Frankel and Rose hypothesis, we add additional variables that can determine the business cycle synchronization in the region. These variables include intra-industry trade, the similarity in economic structure, financial integration, the volatility of exchange rate, and monetary and fiscal policy coordination variables.

4.1. Variables

This section explains the variables' construction, definition, and data sources.

4.1.1. Business cycle synchronization

In Frankel and Rose (1998) hypothesis, we need to compute the business cycle co-movements of the sample countries. We compute the business cycle's correlation of the detrended real GDP through the Hodrick-Prescott (HP) filter. For robustness check, we also use other detrending techniques such as Baxter-King (BP) and Butterworth to detrend the real GDP.⁵⁵ It is computed through the rolling correlation between the detrended GDP of pair countries. Furthermore, a five-year moving average is used to calculate the moving correlation instead of a static one. It is given as:

$$CORR_{ijt} = corr(Y_{it}, Y_{jt}) \quad (2.1a)$$

In the above equation, $CORR_{ijt}$ indicates the Pearson correlation between the detrended GDP of country i and j at time t , whereas Y_i and Y_j represents the GDP of both countries. The correlation value lies between -1 and 1. The correlation value of 1 indicates a perfectly positive, whereas -1 shows a perfectly negative correlation.

However, the above measurement of correlation introduces several problems. Otto et al. (2001) and Inklaar et al. (2008) demonstrate that the error terms are unlikely to be normally distributed if the business cycle synchronization lies between -1 and 1. As the Pearson correlation bounds the value between -1 and 1, they transform their BCS measure to ensure that the errors are normally distributed. Furthermore, Duval et al. (2016) point out that the measurement of correlation by the rolling Pearson method introduces serial correlation due to the overlapping observations. Unlike the previous studies that only rely on Pearson correlation, we use the quasi-correlation, which has several advantages. The first advantage of using quasi-correlation is that the value is not bound to lie between -1 and 1, which prevents us from violating the violation of normality assumption.⁵⁶ The second advantage is that it can be measured at any point instead of over a specific time interval. In our study, the instantaneous quasi-correlation of real GDP is measured in the following way, as proposed by Abiad et al. (2013):

$$QCORR_{ijt} = \frac{(Y_{it} - \bar{Y})(Y_{jt} - \bar{Y})}{\sigma_i \sigma_j} \quad (2.1b)$$

⁵⁵ Similar to Eggoh and Belhadj (2015), we use Christiano and Fitzgerald (2003) for the BP-filter.

⁵⁶ It addresses the problem of normality realized by Otto et al. (2001) and Inklaar et al. (2008).

Whereas the $QCORR_{ijt}$ represents the instantaneous quasi correlation between the GDP of country i and j at time t , Y_{it} represent the i th country's GDP at period t ; \bar{Y}_i and σ_i denote the arithmetic mean and standard deviation of i th country's GDP, respectively.

The annual data of real GDP over the period 2005-2015 comes from the World Bank.

4.1.2. Trade intensity

As mentioned earlier, we use bilateral trade intensity to test the endogenous theory of OCA postulated by Frankel and Rose (1998) and measure it by using value-added trade. We obtain data from the 2018 release of the OECD TiVA database that excludes all the double-counted terms (Direct or indirect trade). We follow the literature and standard definition of Frankel and Rose (1998) to compute bilateral trade intensity. The value-added trade intensity between country i and j at time t (TI_{ijt}) is given as the ratio of bilateral value-added trade between the trading partner to the sum of their GDP. It is given as follows:

$$TI_{ijt}^{VAT} = \ln \left(\frac{DVA_{ijt} + DVA_{jit}}{GDP_{it} + GDP_{jt}} \right) \quad (2.2)$$

In the above equation, TI_{ijt}^{VAT} indicates the log value of bilateral value-added trade between country i and j at time period t (directly or indirectly trade), DVA_{ijt} shows the i th country's domestic value-added exports to country j at time period t , and GDP_{it} shows the real GDP of the i th country at the time t .

We also compute the trade intensity through another method proposed by Frankel and Rose (1998) for robustness purposes. In calculation, we take the ratio of bilateral trade to total trade to compute trade intensity. It is given as follows.

$$TI_{ijt}^{VAT} = \ln \left(\frac{X_{ijt} + M_{ijt}}{X_{it} + X_{jt} + M_{it} + M_{jt}} \right). \quad (2.3)$$

In the above equation, X_{ijt} represents the exports of country i to j , M_{ijt} denotes the imports of country i from j , X_{it} shows the total exports of country i to the world, and M_{it} represents the total imports of country i from the world. The value-added trade is obtained from the OECD TiVA 2018 release.⁵⁷

⁵⁷ In our paper, we get the value-added trade data from the 2018 release of OECD database that provide the data over the period of 2005-2015. So, the period of time in our analysis is based on the data availability.

However, to confirm that the value-added trade drives the business cycles and the use of gross trade data is inappropriate, we also compute trade intensity in a gross term. For this purpose, we replace the value-added trade with the gross trade and measure the trade intensity as follows:

$$TI_{ijt}^{GROSS} = \ln \left(\frac{X_{ijt} + X_{jit}}{GDP_{it} + GDP_{jt}} \right) \quad (2.4)$$

Whereas, TI_{ijt}^{GROSS} is the bilateral trade intensity (in gross terms) between trading partner i and j at period t , X_{ijt} indicate gross export of country i to j at period t , whereas GDP_{it} shows the GDP of country i at period t .

For validation of the Frankel and Rose (1998) hypothesis, the coefficient of trade intensity must be positive to indicate that high bilateral trade induces business cycle synchronization. Krugman (1993), on the other hand, argues that the trade between the two countries mostly takes place based on comparative advantage, and the industry-specific shock will reduce the business cycle synchronization. However, recent studies emphasize that trade is more likely to introduce synchronization of the business cycle if intra-industry trade is dominant. Following the literature, we also include a variable for intra-industry trade.

4.1.3. Intra-industry trade

We compute the intra-industry trade via Grubel and Lloyd (1975) index for the trading partner i and j at period t . Unlike the previous studies that calculate the intra-industry trade using gross trade data, we use value-added trade data of 54 industries to compute the Grubel-Lloyd index (1975) given as:⁵⁸

$$IIT_{ijt} = 1 - \frac{\sum_{n=1}^{54} |DVA_{ijt}^n - DVA_{jit}^n|}{\sum_{n=1}^{54} (DVA_{ijt}^n + DVA_{jit}^n)} \quad (2.5)$$

Whereas, DVA_{ijt}^n indicates the domestic value-added export of industry n from country i to j in period t , and the DVA_{it}^n is the total exports (value-added) of the n th industry of country i . The higher value of this index (close to 1) represents the intra-industry trade, whereas the value close to zero indicates the specialization effect and is the signal of inter-industry trade.

⁵⁸ We take the value-added trade data from the OECD database (ISIC Rev. 4). Furthermore, we calculate the Grubel-Lloyd index for each of the 54 industries and take average of all these to get the IIT_{ijt} .

The disaggregated value-added trade data is also obtained from the OECD 2018 TiVA database.

4.1.4. Fiscal policy variable

Fiscal policy convergence is also considered a determinant of business cycle synchronization. We construct a fiscal policy similarity by taking an absolute difference of the government expenditure (percentage of GDP) between the two countries. It is given as follows:

$$FIS_{ijt} = \frac{1}{T} \sum_1^t \left| Govt_Cons_{it} - Govt_Cons_{jt} \right| \quad (2.6)$$

FIS_{ijt} represents the similarity of fiscal policy between country i and j at time t , which shows the absolute difference in government expenditure between the two economies. Similar to the monetary policy, the fiscal policy variable is expected to foster the business cycle synchronization as the economies with a similar fiscal policy would react in a similar way to the shock. As a high difference in fiscal policy similarity indicates different fiscal policies of both countries, we expect a negative sign of fiscal policy similarity. The data on government expenditure (percentage of GDP) is also taken from the International Monetary Fund (IMF) database.

4.1.5. Monetary policy variable

As explained in the introduction, how monetary policy affects the business cycle synchronization, we need to compute a variable for the monetary policy. We calculate the absolute difference between the policy rate of the two countries to calculate the monetary policy variable, as this differential can affect the business cycle synchronization in one way or another. It is given as follows:

$$MON_{ijt} = \frac{1}{T} \sum_1^t \left| Policy_Rate_{it} - Policy_Rate_{jt} \right| \quad (2.7)$$

In the above equation, MON_{ijt} represents the monetary policy between country i and j at time t , which is equal to the absolute difference between the policy rate of country i and j . If the two countries have a close monetary policy, we expect that both would react and be affected similarly by the shock. In this case, the lesser difference in the policy rate between the two countries would probably generate a more synchronized business cycle. On the other side, we

expect a less synchronized business cycle if the countries adopt a different monetary policy. So, we expect a negative sign of monetary policy as a less difference in the policy rate would probably produce more business cycle synchronization and vice versa. The data of the policy rate is taken from the International Monetary Fund (IMF) database.

4.1.6. Exchange rate volatility

The fluctuations in the exchange rate can also determine the business cycle synchronization through a direct or indirect channel. For this purpose, we follow Bahmani-Oskooee, Iqbal and Khan (2017) and calculate it by taking the standard deviation of the twelve months nominal bilateral exchange rate in the same year. The exchange rate data also comes from the International Monetary Fund (IMF) database. We expect a negative impact of exchange rate volatility on business cycle synchronization because it negatively affects economic activities.⁵⁹

4.1.7. Industrial similarity index

The similarity of economic structure is also expected to affect the BCS directly or indirectly. The similarity in economic structure increases business cycle synchronization between the countries (Krugman, 1993; Clark, 1998; Imbs, 2004; Kalemli-Ozcan et al. (2001)). If the countries have similar production structures, an industry-specific shock generates synchronization of the business cycle in the region.

To control for this, we construct a variable for production similarity and calculate the Krugman (1991) index. The industrial similarity index of the two countries is calculated by analyzing the value-added composition of each sector in their GDP. To calculate the Krugman (1991) index, we use the value-added share of manufacturing and agriculture to compute it. It is given as:

$$S_{ijt} = 1 - \sum_{n=1}^2 |S_{it}^n - S_{jt}^n| \quad (2.8)$$

Whereas, S_{it}^n and S_{jt}^n represent the portion of sector n in GDP of country i and j at time t , respectively. The variable is constructed in such a way that the value lies between 0 and 1. The value close to one indicates the complete similarity between the countries, while zero

⁵⁹ For example, the risk-averse investors reduce their investment if the exchange rate is high volatile. Similarly, it also affects the trade flows and foreign direct investment (FDI).

shows completely different economies. We expect a positive impact of industrial similarity as high value represents similarity in the industry's shares of country i and j . The data of S_{it}^n and S_{jt}^n come from the World Bank.

4.1.8. Financial integration

We also control for the impact of financial integration, which is also widely used in the literature. The impact of financial integration on business cycle synchronization is ambiguous and unclear in the literature. On the one hand, Kalemli-Ozcan et al. (2003) expect a positive relationship between financial integration and business cycle synchronization. According to them, if the banking sector faces a negative shock, all the banks would withdraw their funds from all the countries, increasing the business cycle synchronization. Similarly, financial relations also induce a high degree of synchronization by producing the demand effect. For example, if the residents of different countries invest a significant amount in a specific stock market, a decrease in the stock market would simultaneously decrease the demand for the investment and consumption goods (Kose et al., 2003).

On the other hand, if firms in a country observe a negative production shock, then the foreign and domestic banks in a more financially integrated world reduce their lending to these affected countries and increase their lending to other countries, which leads to further diverge the business cycles (Morgan et al., 2004). Similarly, there is a view that financial integration reduces the business cycle synchronization if it induces specialization and encourages inter-industry trade. Kalemli-Ozcan, Papaioannou and Peydro (2013) also point out the strong negative relationship between banking integration and output synchronization, conditional on heterogeneity between the countries and global shocks.

Keeping in mind the importance, we include a financial integration variable which is computed using the index of Chinn and Ito (2008).⁶⁰ To measure the index, they consider the existence of several exchange rates, restrictions on transactions of the current account, restrictions on capital account transactions, and the need for the surrender of export proceeds.⁶¹ Following Ng (2010), we sum their pair-wise individual indices to build bilateral financial integration.

⁶⁰ The index is updated and can be found at http://web.pdx.edu/~ito/Chinn-Ito_website.htm

⁶¹ Ito and Chinn (2008) develop the capital account index referring to the above mentioned four measures mentioned in the yearly report of IMF on exchange arrangement and exchange restrictions. This index has several advantages over the others. It is transparent in calculation, cover a large set of countries, and can easily be updated.

4.1.9. Other control variables

Apart from the above variables, we include and control for the other variables used in the literature that can affect the business cycle synchronization. We follow Kalemli-Ozcan et al. (2013b) and control for the likelihood of different growth dynamics across countries through the absolute difference of log per capita GDP, the product of the log population of both countries, and the product of log GDP of both countries.

4.2. Data

For our study, we use data over the period 2005-2015. We take the data of the required variables from different sources. These sources include the World Bank, the International Monetary fund (IMF), The Organisation for Economic Co-operation and Development (OECD), and the Chinn and Ito index of financial integration. We take the data of real GDP from the World Bank (World Development Indicator) to calculate the business cycle synchronization. To compute trade intensity and intra-industry trade, gross trade, value-added trade, and disaggregated product data come from the OECD database. As we also analyze the impact of monetary and fiscal policy on business cycle synchronization, we need the policy rate and government expenditures data. For this purpose, we get the data of these policy variables from the IMF database. The data on financial integration is obtained from Chinn and Ito (2008) index, whereas the data on similarity in economic structure is obtained from World Bank.

Table 2.1 presents the descriptive statistics of the variables used in our study. We calculate business cycle synchronization in different ways. BCS1 indicates the business cycle synchronization measured through the quasi-correlation method, which has several advantages over the Pearson correlation. The average value of BCS1 is 0.83 and ranges from -10.72 to 12.21. In contrast to BCS1, other BCS (2-4) are calculated of the detrended GDP through the Pearson correlation method, and their values lie between -1 and 1. These BCS (2-4) are calculated through Pearson correlation by detrending the real GDP through Hodrick–Prescott (hp), Baxter-King (BP), and Butterworth filter, respectively. The average values of all the BCS from 2 to 4 are closer.

We measure two types of trade intensity, i.e., the gross trade and the value-added trade intensity. The average log value of trade intensity in gross terms is -3.67 and ranges from -4.89 to -2.01. This indicates a diversified trade intensity between the countries. Most of them have

high trade intensity, whereas few of them have low trade intensity. Similarly, the average value of value-added trade intensity is -5.33 and lies between -7.07 to -3.80. Just as gross trade intensity, the value trade intensity also shows a diversified trade among the East Asian countries. We measure the Grubel-Lloyd index to determine whether the trade in East Asia and ASEAN is inter-industry or intra-industry. The value of this index lies between 0.04 to 0.94, and its average value is 0.339. This shows the combination of inter-industry and intra-industry trade in the region. This may be because we consider all the fifty-four industries available on the OECD website instead of considering only a few sectors. The financial integration average value is 0.96, and the value ranges from -2.41 to 4.72. This reflects the fact of diversified financial integration in East Asia and ASEAN. Most East Asian countries have a similar economic structure which is clear from its average value of 0.87. The value ranges from 0.79 to 0.97 and expresses a similar regional economic structure. As far as the policy variables are concerned, we observe diversified economic policies in the region. The value of the monetary policy variable lies between 0.01 to 14.95, whereas the fiscal policy variable ranges from 0.003 to 14.28. We observe a less volatile exchange rate in East Asia (0.143 on average), and the value ranges from 0 to 2.43.

Table 2.1: Descriptive statistics

Variables	Obs.	Mean	Std. Dev.	p50	p75	Min	Max
BCS1 (Quasi)	495	0.833	2.529	0.481	1.465	-10.722	12.213
BCS2 (hp)	495	0.458	0.443	0.575	0.784	-0.95	0.996
BCS3 (BP)	495	0.416	0.467	0.533	0.76	-0.946	0.981
BCS4 (Butt)	495	0.395	0.463	0.528	0.752	-0.968	0.97
Trade Intensity (Gross trade)	495	-3.669	0.61	-3.705	-3.314	-4.887	-2.009
Trade Intensity (Value-added trade)	495	-5.331	0.627	-5.326	-4.935	-7.065	-3.803
Intra-industry Trade	495	0.339	0.222	0.375	0.517	0.004	0.94
Financial Integration	495	0.962	1.858	1.158	2.224	-2.405	4.72
Similarity in Economic Structure	495	0.87	0.057	0.86	0.899	0.786	0.973
Fiscal Policy	495	4.522	3.008	4.046	6.44	0.003	14.277
Monetary Policy	495	3.028	2.33	2.5	4.27	0.01	14.95
Exchange Rate Volatility	495	0.143	0.409	0.008	0.084	0	2.425

4.3. Estimation methodology

As the aim of this research paper is to analyze the effect of trade intensity on the business cycle by using the value-added trade data of East Asia and ASEAN over the period of 2005-2015, we focus on the equation of Frankel and Rose (1998).⁶² As described in the previous section, however, we need to include other factors missing in the baseline equation of Frankel and Rose (1998). These variables are intra-industry trade, financial integration, industrial similarity, exchange rate volatility, fiscal and monetary policy variables, and the variables to control for the likelihood of different growth dynamics in different countries.

However, we should be conscious of the estimation of Frankel and Rose (1998) proposition because of the possible endogeneity. The endogeneity may arise because of factors other than the trade that drives the business cycle synchronization, or there may exist a reverse causality as the higher synchronization of the business cycle may induce the countries to increase their trade.⁶³ The simple OLS result will generate inconsistent and biased estimates in such circumstances. The literature shows different econometric techniques used to handle the endogeneity problem.⁶⁴ Our study uses the independent variable's one-year lagged value to address the reverse causality issue. To address the omitted variable biasedness, we follow Kalemli-Ozcan et al. (2013) and use the year and country-pair fixed effect to control for the country-pair-heterogeneity and time-varying factors. Our econometric specification takes the following form used in recent literature:

$$\begin{aligned} CORR_{ijt} = & \alpha_{ij} + \alpha_{it} + \alpha_{jt} + \beta_1 TI_{ijt-1} + \beta_2 IIT_{ijt-1} + \beta_3 SI_{ijt-1} + \beta_4 FI_{ijt-1} \\ & + \beta_5 Fiscal_{ijt-1} + \beta_6 Monetary_{ijt-1} + \beta_7 Volatility_{ijt-1} + \delta Z_{ijt-1} + \varepsilon_{ijt} \end{aligned} \quad (2.9)$$

As defined in the previous section, $CORR_{ijt}$ is the correlation between the output of country i and j at time t (instantaneous quasi-correlation and Pearson correlation), TI_{ijt-1} is the bilateral trade intensity in year $t-1$, IIT_{ijt-1} is the intra-industry trade at period $t-1$, SI_{ijt-1} indicates the similarity in economic structure in period $t-1$, FI_{ijt-1} shows bilateral financial

⁶² The data period is selected purely on the basis of data availability.

⁶³ According to Duval et al. (2016), the business cycle synchronizations may be the consequence of variables that are missing in the model; or the greater BCS may motivate countries to increase their bilateral trade resulting in reverse causality.

⁶⁴ In literature, we see different econometric technique to investigate the effect of trade intensity on synchronization of business cycle, such as pooled OLS, fixed and random effect, or instrumental variable technique. However, several drawbacks of these technique to measure the equation are given in the literature. For example, Shin and Wang (2005) identify that even though there is high correlation between trade intensity and instrumental variable (proposed by Frankel and Rose, 1998), but have no correlation with the intra-industry trade. In our research study, we adopt the most recent methodology proposed in the updated literature.

integration in time period $t-1$, $Fiscal_{ijt-1}$ and $Monetary_{ijt-1}$ reflect the fiscal and monetary policy similarity in the previous year, respectively. $Volatility_{ijt-1}$ is the exchange rate volatility in year $t-1$, whereas Z_{ijt-1} indicated the other control variables, such as the absolute difference of log per capita GDP, the multiplied log population of both countries, and the multiplied log GDP of both countries, in the previous year. Whereas, α_{ij} is the unobserved bilateral time-invariant factors, α_{it} and α_{jt} are the time effect, and ε_{ijt} indicates the error term.

5. Results

In this part, we present the results of equation (2.9). First, we present the baseline equation for East Asia and ASEAN using the quasi-correlation. We replace quasi-correlation (BCS) in the second step with the Pearson correlation method for robustness. We detrend real Gross Domestic Product (GDP) for the Pearson correlation method through various filters.

5.1. The baseline results

This section presents our findings of equation (2.9) for East Asia and ASEAN. In our 1st step, we estimate seven different regressions for East Asia and report the results in table 2-2. As described in the previous section, our dependent variable is the instantaneous quasi-correlation of real GDP. Following Duval et al. (2016), we include the log GDP product, the absolute difference between the log GDP per capita of both countries, the multiplication of the log population of both countries, year fixed effect, and country pair fixed effect in all regressions. Following Kalemli-Ozcan et al. (2013) and Duval et al. (2016), we cluster the standard errors at the country-pair level to address the possible serial correlation. Table 2.2 shows the findings in columns 1-7 for each regression. In column (1), we use the trade intensity based on gross trade as an independent variable to check which type of trade drives the business cycle's co-movements. The aim is to compare the results with the previous studies that use gross trade data to assess the relationship between trade intensity and business cycle synchronization. By doing so, we get a statistical insignificance effect of gross trade intensity on the business cycle harmonization. The results match with the studies of Abiad et al. (2013), Duval et al. (2016), and Jiang et al. (2019), who also controlled for country-pair and time-fixed effects to control for the omitted variable biasedness and found an insignificant effect of gross trade on BCS. This result is because of the fact that the value-added exports contribute to the GDP of a country instead of the gross trade. Furthermore, Duval et al. (2016) also present a theoretical underpinning for the role of value-added trade in business cycle synchronization.

For this purpose, we replace the gross trade intensity with the trade intensity based on value-added trade and report the results in columns 2-7.

Table 2.2: Baseline results: trade intensity and business cycle synchronization in East Asia

Dependent Variable: Quasi correlation of Output Growth Rates							
	OLS 1	OLS 2	OLS 3	OLS 4	OLS 5	OLS 6	OLS 7
Trade Intensity (Gross trade)	0.12 (0.25)						
Trade Intensity (Value-added)		2.669** (0.742)	2.642** (0.738)	2.39*** (.696)	2.286*** (.694)	2.245** (0.687)	2.434** (0.683)
Intra-Industry Trade			5.593** (2.638)	5.913** (2.486)	5.98** (2.474)	6.016** (2.456)	6.043** (2.439)
Financial Integration				1.332** (0.187)	-1.218*** (0.192)	1.248** (0.19)	1.174** (0.192)
The similarity in production structure					14.979** (6.441)	14.09** (6.388)	15.296** (6.529)
Exchange rate Volatility						4.974** (1.713)	5.418** (1.732)
Fiscal Policy							0.239** (0.12)
Monetary Policy							0.134** (.063)
Absolute Difference in log PPP GDP per capita	1.229 (1.262)	0.793 (1.262)	1.001 (1.26)	0.909 (1.187)	0.816 (1.181)	0.584 (1.172)	-0.048 (1.181)
Product of log Population	0.406* (0.225)	2.081** (1.061)	1.743 (1.069)	0.251 (1.028)	1.051 (1.078)	0.954 (1.069)	1.492 (1.081)
Product of log GDP	1.714 (1.065)	0.38 (0.241)	.498** (0.246)	0.638** (0.232)	0.594** (0.232)	0.556** (0.23)	0.36 (0.239)
Country-pair fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year-fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observation	450	450	450	450	450	450	450
R-squared	0.41	0.41	0.42	0.48	0.49	0.50	0.52

***, **, and * show the significance at 1%, 5%, and 10%, respectively. The values next to the coefficients (in brackets) are the robust standard errors. The standard errors are clustered at the country-pair level.

Unlike the gross trade intensity, we find a statistically significant and higher coefficient for the value-added trade intensity reported in columns 2-7. The results reflect the fact that the supply chain has vastly increased in East Asian countries, and the value-added trade is the main determinant of BCS. In columns 2-7, we see that the coefficient of bilateral trade intensity based on value-added trade is significantly higher than gross trade intensity and statistically significant. The findings match the recent literature that uses value-added trade data. The results reveal that while the gross trade intensity does not determine BCS, the value-added trade intensity does.

As stated in the earlier section, we include intra-industry trade to check its impact on BCS and report the result in columns 3-7. We get positive and significant effects of intra-industry trade on business cycle synchronization. The results support the view of Frankel and Rose (1998) as they postulate that business cycle synchronization enhances if the intra-industry trade is more profound than inter-industry trade. Our intra-industry trade results match the findings of Shin and Wang (2004) and Duval et al. (2016), who also find intra-industry trade as the main determinant of BCS in East Asia.

In columns 4-7, we add another important variable and assess financial integration's impact on East Asia's business cycle synchronization. We find a significant coefficient for financial integration, and it promotes business cycle synchronization in the region. The negative coefficient of financial integration is justified by Kalemli-Ozcan et al. (2013b). According to them, if a negative shock hits the financial markets, the banks operating globally withdraw their funds across countries. By doing so, they spread the domestic financial crises globally, leading to a synchronized business cycle in the region. For example, the Asian financial crisis of 1997-98 that started in Thailand quickly spread to other Asian countries. The region experienced a significant drop in capital inflows of more than a hundred billion dollars.⁶⁵

We assess the effect of similarity in the economic structure on business cycle synchronization (BCS) and report the results in columns 5-7. We get the expected outcome for the similarity in economic structure as it negatively affects the business cycle synchronization.⁶⁶ These results show that the lesser economic structure leads to more synchronization of the business cycle in the region. The results of financial integration and

⁶⁵ The Asia crises were declared a global crisis when it affected the Brazilian and Russian economies.

⁶⁶ The variable to measure the similarity in economic structure is measured as the absolute difference between the composition of different sector's share in the GDP of both countries. The higher difference represent different composition of industries' shares in the GDP. Thus higher the value, higher is the difference between their economic structure and vice versa.

similarity in economic production match the recent literature (e.g., Duval et al., 2016; Jiang et al., 2019).

Apart from the determinants mentioned above, we also explore the impact of exchange rate volatility and the policy variables on business cycle synchronization and report the results in columns 6-7. We get the expected results for the exchange rate volatility as it possesses a negative and significant coefficient in both columns. This outcome indicates that the higher volatility of the exchange rate negatively affects the region's business cycle synchronization. Regarding policy coordination, we include fiscal and monetary policy variables to assess their impact on business cycle co-moments. The results of the policy variables are given in column 7. Both the variables (fiscal and monetary policy variables) possess their expected sign and significant coefficients. This indicates that the higher difference between countries' economic policies reduces the business cycle synchronisation. So, the countries should enhance coordination among their economic policies to promote business cycle synchronization in the region.

In our 2nd step, we estimate equation (2.9) for the ASEAN members to explore the nexus between trade intensity and business cycle synchronization. For this purpose, we separate the data of six ASEAN countries from the rest of the EAST ASIA. The results of the ASEAN baseline equation are given in table 2.3 in columns 1-7. First, we estimate equation (2.9) using the gross trade data as we did for East Asia. Just like in East Asia, the gross trade intensity carries an insignificant coefficient. Once we replace the gross trade with the value-added trade, we get a significant and positive impact of trade intensity on BCS reported in columns 2-7. This also specifies that ASEAN's value-added trade drives the business cycle rather than the gross trade. However, the coefficient is significant only at 10% when we add the exchange rate volatility and policy variables in columns 6-7. This shows the importance of exchange rate volatility and policy coordination in transmitting the BCS beyond the trade connection.

We analyze intra-industry trade's role in transmitting the business cycle synchronisation in ASEAN and report the results in columns 3-7. We find a positive and significant effect of intra-industry trade on BCS in ASEAN. Regarding financial integration, we observe a negative and significant impact on the BCS in ASEAN and match with the findings of Kalemli-Ozcan et al. (2013b) and Duval et al. (2016). The variable, similarity in economic structure, carries an insignificant coefficient reported in columns 4-7. At the same time, we find an insignificant impact of similarity in the economic structure on business cycle synchronization and report the findings in columns 5-7.

As expected, the exchange rate volatility negatively affects the business cycle synchronization. The ASEAN countries need to stabilize the region's exchange rate to enhance the co-moments of the business cycle. Just as in the previous section, we also analyze the role of policy coordination in the transmission of BCS in ASEAN and give the results in column 7. We find different impacts for both variables. The coordination in Monetary policy significantly affects the business cycle synchronisation, whereas fiscal policy possesses an insignificant coefficient.

Table 2.3: Trade intensity and business cycle synchronization in ASEAN

Dependent Variable: Quasi correlation of Output Growth Rates							
	OLS 1	OLS 2	OLS 3	OLS 4	OLS 5	OLS 6	OLS 7
Trade Intensity (Gross trade)	0.05 (0.50)						
Trade Intensity (Value-added)		2.49*** (0.89)	2.42*** (0.83)	1.64** (0.82)	1.75** (0.84)	1.49* (0.84)	1.46* (0.81)
Intra-Industry Trade			5.30** (2.69)	5.40** (2.62)	5.69** (2.66)	5.81** (2.61)	5.93** (2.58)
Financial Integration				-0.65*** (0.21)	-0.68*** (0.21)	-0.76*** (0.24)	-0.67*** (0.21)
Similarity in production structure					-10.50 (7.49)	-10.02 (7.36)	-4.95 (7.81)
Exchange rate Volatility						-6.60** (2.88)	-5.58* (3.01)
Fiscal Policy							-0.21 (0.19)
Monetary Policy							-0.19*** (0.06)
Absolute Difference in log PPP GDP per capita	0.49 (1.93)	1.76 (3.72)	1.78 (3.49)	-1.43 (3.43)	-1.26 (3.52)	-2.80 (3.52)	-2.53 (3.44)
Product of log GDP	-0.22 (0.37)	4.12*** (0.73)	3.77*** (0.69)	4.53*** (0.71)	4.49*** (0.71)	3.83*** (0.76)	4.20*** (0.78)
Product of log Population	0.21 (0.76)	-1.24 (1.50)	-0.82 (1.43)	-0.75 (1.40)	-0.68 (1.54)	-0.56 (1.60)	-0.97 (1.55)
Country-pair fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year-fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observation	150	150	150	150	150	150	150
R-squared	0.74	0.63	0.68	0.70	0.71	0.72	0.74

***, **, and * show the significance at 1%, 5%, and 10%, respectively. The values next to the coefficients (in brackets) are the robust standard errors. The standard errors are clustered at the country-pair level.

5.2. Robustness check

In this section, we perform several exercises to verify that the baseline results are robust. In our first step, we calculate business cycle synchronization through the commonly used Pearson correlation method after detrending the real GDP through three different filters. In the second step, we calculate the trade intensity through another way proposed by Frankel and Rose (1998) and replace the earlier trade intensity with this newly computed variable. This enables us to compare the results of trade intensity computed in two different ways.

As mentioned in the above paragraph, we calculate the business cycle synchronization (BCS) after detrending the real GDP through three different filters and replacing each one with the quasi-correlation.⁶⁷ First, we use the Hodrick-Prescott (HP) filter to detrend the real GDP and report the results in table 2.4. Second, we detrend the real GDP through the Band-Pass (BP) filter and compute the BCS. The results are given in table 2.5. Third, we use the Butterworth filter to detrend the real GDP and report the result in table 2.6. We do the same practice for the ASEAN and report their results in table 2.7 to 2.9, respectively.

We detrend the real GDP through Hodrick-Prescott (HP), Band Pass (BP), and Butterworth filter and replace the quasi correlation with the newly measured BCS to estimate equation (2.9).

Table 2.4 to 2.6 reports East Asia's results by using alternative methods to compute the business cycle synchronization. The results almost match the baseline results. Just as the baseline results, the gross trade carries an insignificant coefficient reported in column (1). The coefficient turns significant once we replace the gross trade intensity with value-added trade intensity (columns 2-7). This indicates that, despite the different techniques to measure BCS, the bilateral value-added trade captures the bilateral trade relation better than gross trade.

Similarly, the intra-industry trade coefficient also remains positive and significant (columns 3-7) and is according to the baseline results. The coefficient of financial integration also matches the baseline results and significantly affects the BCS in East Asia. Though the similarity in economic structure possesses a positive sign, it's insignificant in all cases reported in columns 5-7. Similarly, we explore the effect of exchange rate volatility and policy coordination on the BCS and report the result in columns 6 and 7. They possess a negative and

⁶⁷ To detrend the real GDP, most of the previous studies use Hodrick-Prescott (HP) filter and then compute the Pearson correlation of detrended data. In order to compare the results with the previous studies, we use HP, BP and Butterworth filter to detrend the real GDP and replace the quasi correlation with this newly constructed variable.

statistically significant coefficient and are similar to the baseline results. So, we can conclude that all the results match the baseline results, except for the similarity in economic structure.

We apply the same procedure by separating the data of ASEAN and report the findings in table 2.7 to 2.9. The coefficients of all the variables possess the same sign as given in table 2.3. The only difference is the insignificant coefficient of exchange rate volatility reported in columns 2-6 to 2-7 in these tables.

As discussed at the start of this section, we also compute trade intensity through another method of Frankel and Rose (1998) for robustness purposes. We calculate this by analyzing the bilateral trade flows to the total trade flows and replacing them with the earlier version of trade intensity. The results for East Asia and ASEAN are given in table 2.10. The findings are almost similar to the baseline results for East Asia and ASEAN. The only difference is the significant coefficient of exchange rate volatility in the ASEAN case given in column 6.

The findings reported in tables 2.4 to 2.10 indicate that results mostly match the baseline findings. These findings confirm that the value-added trade, along with the other determinants, significantly affects the regional business cycle synchronisation. Policy coordination and exchange rate volatility are also essential factors in transmitting the business cycle's co-moments in East Asia and ASEAN.

Table 2.4: Robustness check: trade intensity and business cycle synchronization in East Asia

Dependent Variable: BCS after detrending the real GDP through Hodrick-Prescott (HP) filter							
	OLS 1	OLS 2	OLS 3	OLS 4	OLS 5	OLS 6	OLS 7
Trade Intensity (Gross trade)	0.24 (0.16)						
Trade Intensity (Value-added)		0.49*** (0.12)	0.48*** (0.12)	0.47*** (0.12)	0.47*** (0.12)	0.46*** (0.12)	0.51*** (0.12)
Intra-Industry Trade			1.90*** (0.45)	1.93*** (0.44)	1.94*** (0.44)	1.88*** (0.44)	1.92*** (0.44)
Financial Integration				-0.07** (0.03)	-0.06** (0.03)	-0.07** (0.03)	-0.05* (0.03)
The similarity in production structure					0.39 (1.16)	0.29 (1.16)	0.42 (1.18)
Exchange rate Volatility						-0.55** (0.27)	-0.67** (0.31)
Fiscal Policy							- 0.06*** (0.03)
Monetary Policy							-0.02** (0.01)
Absolute Difference in log PPP GDP per capita	-0.17 (0.25)	0.02 (0.21)	0.04 (0.21)	0.04 (0.21)	0.03 (0.21)	0.01 (0.21)	-0.09 (0.17)
Product of log GDP	0.023 (0.05)	0.08** (0.04)	0.10** (0.04)	0.11*** (0.04)	0.11*** (0.04)	0.10** (0.04)	0.05 (0.04)
Product of log Population	-0.082 (2.16)	0.02 (0.18)	-0.03 (0.18)	-0.11 (0.18)	-0.09 (0.19)	-0.10 (0.19)	0.03 (0.19)
Country-pair fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year-fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	450	450	450	450	450	450	450
R-squared	0.51	0.438	0.444	0.450	0.451	0.454	0.48

***, **, and * show the significance at 1%, 5%, and 10%, respectively. The values next to the coefficients (in brackets) are the robust standard errors. The standard errors are clustered at the country-pair level.

Table 2.5: Robustness check: trade intensity and business cycle synchronization in East Asia

Dependent Variable: BCS by detrending the real annual GDP through Band Pass (BP) filter							
	OLS 1	OLS 2	OLS 3	OLS 4	OLS 5	OLS 6	OLS 7
Trade Intensity (Gross trade)	0.12 (0.16)						
Trade Intensity (Value-added)		0.44*** (0.14)	0.43*** (0.14)	0.41*** (0.14)	0.41*** (0.14)	0.40*** (0.14)	0.45*** (0.14)
Intra-Industry Trade			0.91** (0.46)	0.96** (0.47)	0.96** (0.47)	0.90* (0.49)	0.91* (0.50)
Financial Integration				-0.10*** (0.03)	- 0.10*** (0.03)	-0.11*** (0.03)	-0.09** (0.03)
The similarity in production structure					0.29 (1.32)	0.18 (1.31)	0.55 (1.34)
Exchange rate Volatility						-0.63** (0.32)	0.71** (0.35)
Fiscal Policy							-0.04** (0.02)
Monetary Policy							- 0.03*** (0.01)
Absolute Difference in log PPP GDP per capita	-0.25 (0.24)	-0.22 (0.24)	-0.19 (0.24)	-0.19 (0.24)	-0.19 (0.24)	-0.22 (0.24)	-0.36 (0.24)
Product of log GDP	-0.02 (0.05)	0.10** (0.04)	0.12** (0.04)	0.13*** (0.04)	0.13*** (0.04)	0.12*** (0.04)	0.08* (0.05)
Product of log Population	- 0.59*** (0.21)	-0.18 (0.20)	-0.24 (0.20)	-0.36* (0.20)	-0.34 (0.21)	-0.36 (0.22)	-0.24 (0.22)
Country-pair fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year-fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observation	450	450	450	450	450	450	450
R-squared	0.46	0.34	0.35	0.36	0.36	0.37	0.39

***, **, and * show the significance at 1%, 5%, and 10%, respectively. The values next to the coefficients (in brackets) are the robust standard errors. The standard errors are clustered at the country-pair level.

Table 2.6: Robustness check: trade intensity and business cycle synchronization in East Asia

Dependent Variable: BCS by detrending the real annual GDP through the Butterworth filter.							
	OLS 1	OLS 2	OLS 3	OLS 4	OLS 5	OLS 6	OLS 7
Trade Intensity (Gross trade)	0.18 (0.16)						
Trade Intensity (Value-added)		0.57*** (0.14)	0.56*** (0.14)	0.54*** (0.14)	0.53*** (0.14)	0.52*** (0.14)	0.57*** (0.14)
Intra-Industry Trade			1.23** (0.52)	1.29** (0.51)	1.30** (0.52)	1.16** (0.50)	1.17** (0.50)
Financial Integration				0.11*** (0.03)	0.11*** (0.04)	0.12*** (0.03)	0.10*** (0.03)
The similarity in production structure					0.49 (1.34)	0.24 (1.31)	0.61 (1.34)
Exchange rate Volatility						1.42*** (0.35)	1.51*** (0.35)
Fiscal Policy							0.05*** (0.02)
Monetary Policy							0.03*** (0.01)
Absolute Difference in log PPP GDP per capita	-0.15 (0.26)	-0.08 (0.24)	-0.03 (0.24)	-0.04 (0.24)	-0.04 (0.24)	-0.11 (0.24)	-0.26 (0.24)
Product of log GDP	-0.03 (0.05)	0.08** (0.04)	0.10** (0.04)	0.12** (0.05)	0.11** (0.04)	0.10** (0.04)	0.06** (0.03)
Product of log Population	-0.31 (0.21)	0.16 (0.20)	0.09 (0.21)	-0.04 (0.21)	-0.01 (0.22)	-0.04 (0.22)	0.08 (0.22)
Country-pair fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year-fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observation	450	450	450	450	450	450	450
R-squared	0.47	0.32	0.33	0.35	0.35	0.37	0.40

***, **, and * show the significance at 1%, 5%, and 10%, respectively. The values next to the coefficients (in brackets) are the robust standard errors. The standard errors are clustered at the country-pair level.

Table 2.7: Robustness check: trade intensity and business cycle synchronization in ASEAN

Dependent Variable: BCS by detrending the real annual GDP through Hodrick-Prescott (HP) filter							
	OLS 1	OLS 2	OLS 3	OLS 4	OLS 5	OLS 6	OLS 7
Trade Intensity (Gross trade)	0.24 (0.16)						
Trade Intensity (Value-added)		0.84*** (0.26)	0.82*** (0.24)	0.60** (0.24)	0.59** (0.24)	0.55** (0.24)	0.53** (0.24)
Intra-Industry Trade			3.58*** (0.77)	3.34*** (0.76)	3.38*** (0.77)	3.31*** (0.77)	3.17*** (0.76)
Financial Integration				- 0.18*** (0.06)	-0.18*** (0.06)	- 0.19*** (0.06)	- 0.18*** (0.06)
Similarity in production structure					0.63 (2.19)	0.71 (2.18)	2.52 (2.35)
Exchange rate Volatility						-1.19 (0.85)	-1.08 (0.90)
Fiscal Policy							0.06 (0.05)
Monetary Policy							-0.03** (0.01)
Absolute Difference in log PPP GDP per capita	-0.17 (0.25)	-0.81 (1.09)	-0.81 (1.01)	-1.33 (0.99)	-1.26 (1.02)	-1.54 (1.04)	-1.39 (1.04)
Product of log GDP	0.02 (0.05)	0.57*** (0.21)	0.46** (0.20)	0.67*** (0.20)	0.67*** (0.20)	0.55** (0.22)	0.66** (0.23)
Product of log Population	-0.08 (0.21)	-0.35 (0.44)	-0.02 (0.41)	-0.17 (0.40)	-0.12 (0.45)	0.08 (0.47)	-0.02 (0.46)
Country-pair fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year-fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observation	150	150	150	150	150	150	150
R-squared	0.60	0.45	0.53	0.56	0.56	0.57	0.59

***, **, and * show the significance at 1%, 5%, and 10%, respectively. The values next to the coefficients (in brackets) are the robust standard errors. The standard errors are clustered at country-pair level.

Table 2.8: Robustness check: trade intensity and business cycle synchronization in ASEAN

Dependent Variable: BCS by detrending the annual real GDP through Band Pass (BP) filter							
	OLS 1	OLS 2	OLS 3	OLS 4	OLS 5	OLS 6	OLS 7
Trade Intensity (Gross trade)	0.24 (0.16)						
Trade Intensity (Value-added)		0.90*** (0.28)	0.89*** (0.27)	0.71** (0.28)	0.69** (0.28)	0.70** (0.28)	0.69** (0.28)
Intra-Industry Trade			3.30*** (0.87)	3.08*** (0.87)	3.11** * (0.89)	3.12*** (0.89)	3.01*** (0.89)
Financial Integration				-0.15** (0.07)	-0.15** (0.07)	-0.15** (0.07)	-0.13* (0.07)
Similarity in production structure					0.48 (2.50)	0.47 (2.52)	1.72 (2.74)
Exchange rate Volatility						0.11 (0.98)	0.42 (1.05)
Fiscal Policy							-0.04* (0.22)
Monetary Policy							0.02 (0.06)
Absolute Difference in log PPP GDP per capita	-0.17 (0.25)	-1.04 (1.20)	-1.04 (1.14)	-1.49 (1.14)	-1.44 (1.17)	-1.41 (1.20)	-1.37 (1.21)
Product of log GDP	0.02 (0.05)	0.74*** (0.23)	0.63*** (0.22)	0.82*** (0.23)	0.82** * (0.24)	0.83*** (0.26)	0.88*** (0.27)
Product of log Population	-0.08 (0.21)	-0.96** (0.84)	-0.63 (0.46)	-0.79* (0.46)	-0.74 (0.52)	-0.76 (0.54)	-0.85 (0.54)
Country-pair fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year-fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observation	150	150	150	150	150	150	150
R-squared	0.32	0.38	0.44	0.47	0.47	0.47	0.48

***, **, and * show the significance at 1%, 5%, and 10%, respectively. The values next to the coefficients (in brackets) are the robust standard errors. The standard errors are clustered at country-pair level.

Table 2.9: Robustness check: trade intensity and business cycle synchronization in ASEAN

Dependent Variable: BCS by detrending the real annual GDP through Butterworth filter.							
	OLS 1	OLS 2	OLS 3	OLS 4	OLS 5	OLS 6	OLS 7
Trade Intensity (Gross trade)	0.45 (0.34)						
Trade Intensity (Value-added)		0.96*** (0.29)	0.94*** (0.28)	0.62** (0.28)	0.63** (0.28)	0.61** (0.28)	0.61** (0.28)
Intra-Industry Trade			3.42*** (0.91)	3.05*** (0.87)	2.98*** (0.89)	2.96*** (0.89)	2.79*** (0.88)
Financial Integration				-0.26*** (0.07)	-0.27*** (0.07)	-0.27*** (0.07)	- 0.24*** (0.07)
Similarity in production structure					-1.02 (2.51)	-0.99 (2.52)	0.87 (2.70)
Exchange rate Volatility						-0.15 (0.98)	-0.06 (1.04)
Fiscal Policy							0.04 (0.06)
Monetary Policy							- 0.05*** (0.02)
Absolute Difference in log PPP GDP per capita	-1.96 (1.29)	0.11 (1.24)	0.12 (1.18)	-0.64 (1.43)	-0.76 (1.18)	-0.86 (0.12)	-0.77 (1.19)
Product of log GDP	-0.22 (0.25)	0.86*** (0.24)	0.76*** (0.23)	1.067*** (0.23)	1.06*** (0.24)	1.01*** (0.26)	1.10*** (0.27)
Product of log Population	0.02 (0.51)	-0.85* (0.50)	-0.51 (0.48)	-0.76 (0.46)	-0.85* (0.51)	-0.78 (0.54)	-0.90 (0.53)
Country-pair fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year-fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observation	150	150	150	150	150	150	150
R-squared	0.33	0.34	0.40	0.47	0.48	0.48	0.50

***, **, and * show the significance at 1%, 5%, and 10%, respectively. The values next to the coefficients (in brackets) are the robust standard errors. The standard errors are clustered at the country-pair level.

Table 2.10: Robustness check: trade intensity and business cycle synchronization in ASEAN

Trade Intensity Measured through Another Method of Frankel and Rose (1998)								
	EAST ASIA				ASEAN			
	1 Quasi Correlation	2 Hodrick- Prescott Filter	3 Band Pass (BP) filter	4 Butterworth filter	5 Quasi Correlation	6 Hodrick- Prescott	7 Band Pass (BP) filter	8 Butterworth filter
Trade Intensity (Value-added)	1.43** (0.72)	0.50*** (0.14)	0.44*** (0.16)	0.64*** (0.16)	1.61* (0.86)	0.59** (0.30)	0.81** (0.34)	0.77** (0.34)
Intra-Industry Trade	6.08** (2.46)	0.92** (0.44)	0.91* (0.50)	1.16** (0.50)	8.72*** (2.54)	3.17*** (0.77)	3.00*** (0.89)	2.79*** (0.87)
Financial Integration	-1.16*** (0.19)	-0.05* (0.03)	-0.09** (0.04)	-0.09** (0.04)	-0.67*** (0.21)	-0.18*** (0.06)	-0.13* (0.07)	-0.24*** (0.07)
Similarity in production structure	15.68** (6.62)	0.37 (1.19)	0.51 (1.35)	0.49 (1.34)	-2.42 (7.80)	2.72 (2.39)	1.95 (2.73)	1.03 (2.69)
Exchange rate Volatility	-5.53*** (1.75)	-0.70** (0.31)	-0.74** (0.35)	-1.55*** (0.35)	-6.09** (2.99)	-1.47* (0.86)	0.19 (1.05)	-0.26 (1.03)
Fiscal Policy	-0.22** (0.11)	-0.06*** (0.02)	-0.04* (0.025)	-0.05** (0.02)	0.23 (0.19)	0.07 (0.05)	0.03 (0.06)	0.05 (0.06)
Monetary Policy	-0.12** (0.06)	-0.02** (0.01)	-0.03** (0.13)	-0.03** (0.01)	-0.17*** (0.06)	-0.03** (0.01)	-0.04** (0.02)	-0.05** (0.02)
Absolute Difference in log PPP GDP per capita	0.42 (1.18)	-0.08 (0.12)	-0.31 (0.24)	-0.22 (0.24)	-2.88 (3.52)	-1.58 (1.06)	-1.65 (1.23)	-1.07 (1.21)
Product of log GDP	0.44* (0.24)	0.06 (0.04)	0.08* (0.04)	0.06 (0.04)	4.38*** (0.78)	0.73*** (0.23)	0.97*** (0.27)	1.17*** (0.26)
Product of log Population	1.14 (1.08)	-0.02 (0.19)	-0.30 (0.22)	0.01 (0.22)	-1.14 (1.55)	-0.06 (0.46)	-0.93* (0.54)	-0.97* (0.53)
Country-pair fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year-fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observation	450	450	450	450	150	150	150	150
R-squared	0.51	0.47	0.38	0.39	0.74	0.58	0.48	0.50

***, **, and * show the significance at 1%, 5%, and 10%, respectively. The values next to the coefficients (in brackets) are the robust standard errors. The standard errors are clustered at the country-pair level.

6. Conclusion

A wide range of studies explore the impact of trade intensity on the synchronization of the business cycle following Frankel and Rose's seminal paper (1998). The empirical studies, by large, find a robust positive effect of trade intensity on business cycle harmonization. However, these studies suffer from a common problem of measuring trade intensity using gross trade and neglect the growing importance of the global supply chain. In the recent pace of globalization, the product cross border several times in the process of production. As the gross trade counts trade statistics at each border instead of the net value-added, the conventional trade data exaggerate exports' domestic content due to the double counting. Moreover, the research does not focus on exploring the impact of exchange rate and policy coordination on business cycle synchronization. We address the first issue by using value-added trade to study trade intensity's effect on business cycle synchronization in East Asia and ASEAN. We include exchange rate volatility and variables for policy coordination to handle the second problem.

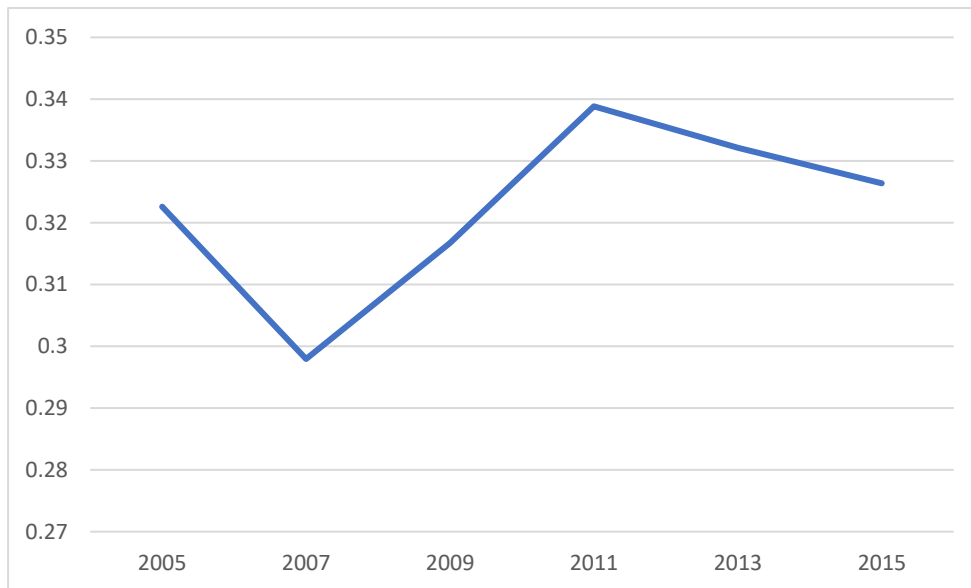
There are two issues regarding the estimation of OLS that need to be addressed. These problems are reverse causality and omitted variable bias. We handle the omitted variable bias by adding the year and country-pair fixed effect. Furthermore, we use the one-year lag value of the independent variable to tackle the reverse causality issue. When we addressed these issues, gross trade turned out to have an insignificant impact on business cycle synchronization. But once we calculate the trade intensity using the value-added trade, we get a significant and sizeable effect of value-added trade intensity on business cycle synchronization in the region. This result is because of the growing supply chain in East Asia and ASEAN. This also indicates that value-added trade is causing co-movements in the business cycle rather than gross trade. Our results also show the importance of intra-industry trade, which is also a key determinant that drives the region's business cycle harmonization. After the inclusion of other control variables, the results remain the same. The exchange rate volatility, financial integration and policy coordination are also essential in promoting business cycle synchronization in the region.

Our results have important policy suggestions for creating a common currency area in the region and fulfilling the ex-post criterion of Frankel and Rose (1998). The region may not yet has adequate momentum to adopt a common regional currency. But the over-dependence of East Asian countries on the dollar may not be useful in the future. Adopting a common currency

will be favorable to solving financial instability faster and more effectively, which will benefit East Asia and the global economy.

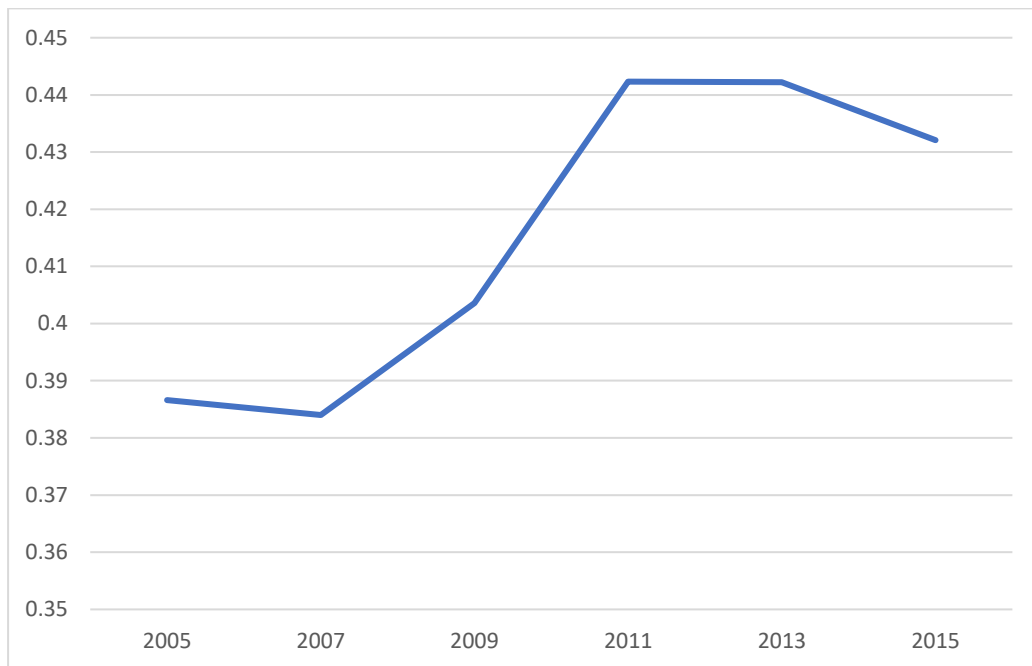
The economic integration in East Asia has grown fast in recent years, and the adoption of a common currency seems more feasible than 20 years back. The common currency in East Asia will be helpful in addressing financial uncertainty in rapid and effective ways. Our results reveal that the value-added and intra-industry trade lead to the business cycle synchronisation in East ASIA and ASEAN. Following the view of Frankel and Rose (1998), the creation of a currency union will be less costly by increasing the chances of symmetric shock in the region. Apart from the trade integration, the East Asia region should reduce its exchange rate volatility and enhance policy coordination to promote business cycle synchronization. Once the region enhances policy coordination and trade integration, East Asia should adopt a common currency to enhance financial stability.

Appendix 2-A: Intra-regional value-added exports share of East Asia.



Appendix 2-A indicates the intra-regional value-added exports share of East Asia. It is calculated as the intra-regional share of value-added exports to the value-added exports to the world. As explained in figure 2-1, the world refers to the 64 countries given in the 2018 release of OECD TiVA database. We see high shares of intra-regional value-added export in East Asia and reach to 32.6% in 2015. The East Asia refers to the 11 countries of our sample, whereas the world refers to the 64 countries given on OECD TiVA database.

Appendix 2-B: Intra-ASEAN exports shares.



Appendix 2-B indicate the intra-ASEAN value-added exports share over the period 2005-2015. It is calculated as the intra-regional value-added share of ASEAN, to their value-added exports to the world. The ASEAN represent the six selected countries in our sample, whereas the world represents the 64 countries of the world given on OECD database. The intra-ASEAN value-added exports increase over time and reach to 43% in 2015.

Appendix 2-C: Industries classification.

S.No.	Industries	ISIC Rev. 4
1	Agriculture, forestry and fishing	01-03
2	Mining and quarrying	05-09
3	Mining and extraction of energy producing products	05-06
4	Mining and quarrying of non-energy producing products	07-08
5	Mining support service activities	09
6	Manufacturing	10-33
7	Food products, beverages and tobacco	10-12
8	Textiles, wearing apparel, leather and related products	13-15
9	Wood and paper products; printing	16-18
10	Wood and products of wood and cork	16
11	Paper products and printing	17-18
12	Chemicals and non-metallic mineral products	19-23
13	Coke and refined petroleum products	19
14	Chemicals and pharmaceutical products	20-21
15	Rubber and plastic products	22
16	Other non-metallic mineral products	23
17	Basic metals and fabricated metal products	24-25
18	Basic metals	24
19	Fabricated metal products	25
20	Computers, electronic and electrical equipment	26-27
21	Computer, electronic and optical products	26
22	Electrical equipment	27
23	Machinery and equipment, nec	28
24	Transport equipment	29-30
25	Motor vehicles, trailers and semi-trailers	29
26	Other transport equipment	30
27	Other manufacturing; repair and installation of machinery and equipment	31-33
28	Electricity, gas, water supply, sewerage, waste and remediation services	35-39

29	Construction	41-43
30	Total business sector services	45-82
31	Distributive trade, transport, accommodation and food services	45-56
32	Wholesale and retail trade; repair of motor vehicles	45-47
33	Transportation and storage	49-53
34	Accommodation and food services	55-56
35	Information and communication	58-63
36	Publishing, audio-visual and broadcasting activities	58-60
37	Telecommunications	61
38	IT and other information services	62-63
39	Financial and insurance activities	64-66
40	Real estate activities	68
41	Other business sector services	69-82
42	Public admin, education, and health; social and personal services	84-98
43	Public admin, defence; education and health	84-88
44	Public admin. and defence; compulsory social security	84
45	Education	85
46	Human health and social work	86-88
47	Other social and personal services	90-98
48	Arts, entertainment, recreation and other service activities	90-96
49	Private households with employed persons	97-98
50	Industry (mining, manufactures and utilities)	05-39
51	Total services	45-98
52	Information, finance, real estate and other business services	58-82
53	Total services (incl. construction)	41-98
54	Information industries	INFO

Chapter 3.

Testing the Orcutt hypothesis in East Asia

1. Introduction

After the collapse of the Bretton woods system in 1973, researchers paid much attention to assessing the response of trade flows to changes in the exchange rate and relative prices. The policymakers aim to see the effectiveness of relative prices and exchange rate in determining the international trade flows in the developing and developed world. Prior to the abolishment of the Bretton wood system, the research focus was only on assessing the price elasticities of export and import flows, generally known as the Marshall-Lerner condition. In this regard, the earlier contribution can be traced back to Orcutt (1950) and Kreinin (1967), who take trade flows as a function of relative prices (i.e., domestic prices relative to foreign prices). The purpose was to explore the response of trade flows to the exogenous shock in relative prices and see whether the export and import elasticity exceeds unity or not. For decades subsequently, it has become an attractive topic to analyze price elasticities for trade policy formation in the developing and developed world.

After the adoption of a flexible exchange rate system, the focus of research is to choose an effective policy between relative prices and exchange rate. For example, suppose a country's export decreases due to slow growth in a trade partner's economy. In that case, a country can devalue its currency or reduce relative prices through subsidies or tariffs to be competitive. Therefore, it is necessary to know trade flows' response to exchange rate and relative prices to make a suitable policy in the competitive world. Warner and Kreinin (1983) analyze the nexus of trade flows and exchange rate and criticize the previous studies for just using relative prices as a proxy for traded commodities. They argue that exploring the impact of exchange rate and price variable is more suitable than using just relative prices to measure their individual effects on trade flows. In fact, Orcutt (1950) was the first who observes that trade flows react sooner to the variation in the exchange rate than they do to the variation in relative prices and that the policy inference of such relation is not uniform. If the Orcutt hypothesis holds, a country needs to concentrate on the exchange rate policy rather than a commercial policy to manage a trade flow shock. This delayed response of trade flows to these above-mentioned variables is because of five economic time lags: i.e. recognition lag, decision lag, delivery lag, replacement lag, and

production lag (Junz and Rhomberg, 1973). The recognition lag occurs because sellers and buyers need time to adjust themselves to changes in the exchange rate and relative price. However, this lag time is higher in the international market than in the domestic market due to distance and language barriers in spreading information. This lag's time length has been reduced as the internet has dramatically enhanced the speed of information spreading worldwide. The internet has made communication easy between economic agents such as buyers and sellers around the globe. Additionally, several professional agencies have developed their skills to predict the possible forthcoming changes that help the economic agents to adjust themselves according to the changing condition faster than a few decades ago. The second lag is known as decision lag. It indicates the gap between the creation of new business relations and the placement of new orders. For instance, changes in the exchange rate or relative prices push the economic agent to substitute foreign and domestic commodities and utilize other inputs to remain competitive in the world market. The third lag, delivery lag, take place because of the distance barriers to reacting to new orders. The producer can't immediately increase its production to meet the new demand and needs time to produce particular products. This type of gap affects a producer's power in the economy, where variations in relative prices occur. The producer cannot immediately react to these changes till they obtain their new orders. The fourth lag is known as replacement lag and is discussed in most literature studies. It occurs because the old stock of material takes time to be utilized and replaced with new material to adjust to the changing global conditions. The main cause for this slow adjustment is that most of the producers sign a binding agreement with the material suppliers. These types of agreements are usually regulated by international trade regulations and cannot be easily reversed. The last and fifth lag is production lag; it refers to the time producers take to alter their production process to respond to the new prices and exchange rate. In response to the changing prices and exchange rate, the producers need time to be persuaded to alter their production process. In case the global market fails to convince producers that the new market suits them, they may quit the market and close their company. These lags affect trade flows' elasticity with respect to exchange rate and relative prices in the long and short run. Therefore, a genuine policy analysis needs to take into account the impact of these lags in trade policies.

After the postulation of Orcutt (1950), the literature also concludes that trade flows respond faster to exchange rate changes than relative prices (e.g., Junz and Rhomberg, 1973; and Wilson and Takacs, 1979). Based on the Orcutt hypothesis, they argue that a country needs immediate policy response if there are significant shocks to the exchange rate than to relative prices. As these two variables seem to be essential factors of export and import flows when it

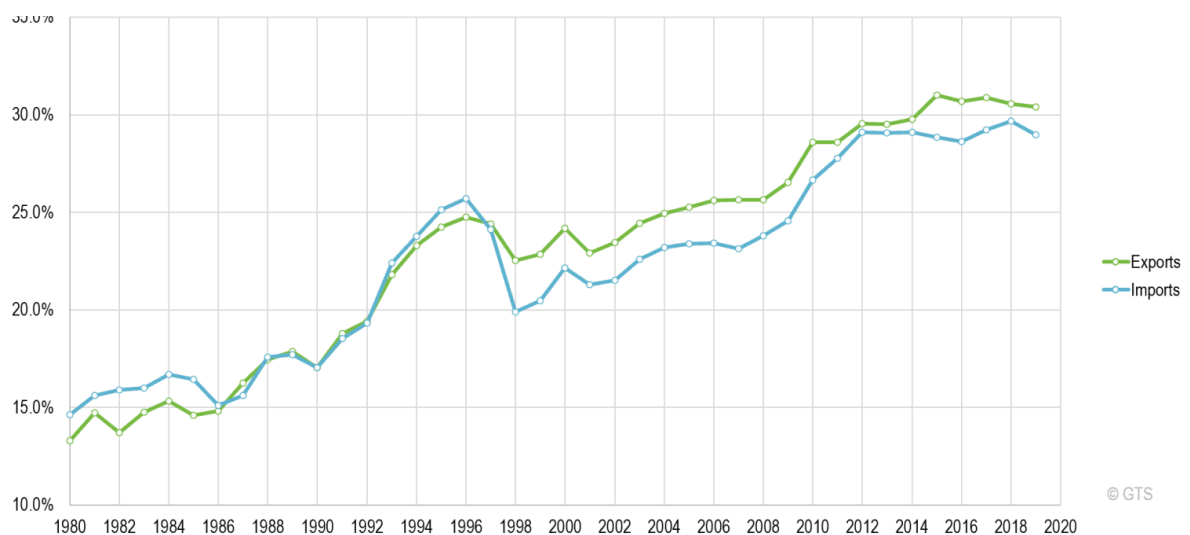
comes to policy recommendations, it is proposed that empirical estimates should always be updated with the changing economic structure for better policy recommendations. Therefore, empirical analysis of income, exchange rate, and price elasticity are considered essential determinants for choosing between commercial and devaluation of exchange rate policy.

These two policies, commercial and exchange rate policy, play a vital role in resolving a country's trade imbalances. The commercial and exchange rate depreciation policies' efficiency entirely relies on export and import flows' elasticities in international trade literature. If the relative prices possess low elasticity, the commercial policy will no longer be efficient in addressing shocks in the country's trade flows. On the contrary, the commercial policy will be effective if relative price elasticity is high. In the first case, when the price elasticity is low, the exchange rate depreciation policy is suggested to address shock in a country's trade flows. However, as explained in the above paragraphs, Orcutt criticizes this approach and recommends that price elasticities are statistically biased and unreliable. Subsequent to his recommendation, the selection between these two policies depends on the responsiveness of trade flows to the variation in the exchange rate and relative prices, not on the magnitude of their elasticity. The exchange rate depreciation is suggested for the economies whose trade flows are sensitive to the exchange rate changes, indicating that export and import flows respond faster to the changes in exchange rate than to changes in relative prices. In contrast, the commercial policy choice is adopted when trade flows respond quicker to relative price variations than the exchange rate variations.

In the literature, two methods are used to assess trade flows' response to the exchange rate changes and relative prices, i.e., the Orcutt hypothesis. The first method analyses the Orcutt hypothesis by imposing the lag structure on the nominal exchange rate and relative prices. The acceptance or rejection of the Orcutt hypothesis depends on the lag structure imposed on each variable. In this process, the Orcutt hypothesis will be accepted if the nominal exchange rate takes fewer lags than relative prices. The second method uses the impulse response function to assess the Orcutt hypothesis by analyzing export and import flows' impulse response to variations in the exchange rate and relative prices. The Orcutt hypothesis holds if the exchange rate shows a quicker response to trade flows as compared to relative price variation. In other words, the emphasis is to analyze the time lag length of each trade flow to the exchange rate and relative price shocks.

Since the 1980s, East Asia's share in world trade has significantly increased, mainly due to its exports. From 16% in 1980, East Asia shares in global exports rose to 30% in 2019. This tendency can be justified by a significant investment that resulted in exports-focused manufacturing sectors using the benefit of low production cost, mainly in terms of labor. The region that was import-dependent in the 1980s is now leading the world through its exports. Furthermore, the East Asian countries significantly depreciated their currency in 1997 and made the region more competitive. This depreciation makes the imported goods more expensive in East Asia and increases their exports due to the low exchange rate. Yet, as expansion happens, the region also consumes an increasing amount of imported goods. The difference between exports and imports becomes narrow after 2008, whereas the region's share in global trade is at a peak (As shown in figure 3.1).

Figure 3.1: Share of East Asia in global trade



Source: World Trade Organization (WTO)

The above discussion raises the question of how the region can further increase its global competitiveness and improve its export share. Policymakers should know whether they should focus on commercial or exchange rate policy. For this purpose, they should know whether the trade flows respond faster to exchange rate changes or relative prices. We do our research study for this high trade intensified region and assess the Orcutt hypothesis for the selected East Asia countries. This study will enable us to know which type of policy would be more effective for these countries.

After this introductory section, we present the literature on the Orcutt hypothesis that analyses the trade flows reaction to the exchange rate changes and relative price changes in the

second section. The third section discusses the models, variables, and the methodology used in our study. The fourth and fifth sections describe the results and conclusion, respectively.

2. Literature review

Orcutt (1950) postulates that the research studies that give attention to price elasticities of imports and exports eliminate the viability of the exchange rate devaluation. He contended that the assessments of these elasticities are not statistically trustworthy. Nonetheless, he demonstrated that deterioration would profoundly improve exports and imports streams of devaluing states without having "retaliatory activity" like limitations on imports or depreciation in exchange accomplice nations. He opposed that studies think little of the viability of currency deterioration. Orcutt stressed that the trade flows price elasticities assessed in certain assessments back the adequacy of devaluation in improving the balance of trade (Liu, 1954; Robinson, 1947). They stress that if the Marshall-Lerner condition holds, i.e., the absolute sum of trade flows elasticities exceeds one, depreciation of the currency will be an effective policy to improve the trade balance. However, some studies oppose this view and find the depreciation of currency an ineffective policy (Adler, 1945; De Vegh, 1941). There is still no agreement among policymakers and researchers on this issue. Lu, Xu, and Liu (2009) find support for Hong Kong's M-L condition using the ARDL approach, whereas Prawoto (2007) confirms the M-L condition for Malaysia and Thailand utilizing the DOLS method for four Asian states. Irandoust, Ekblad, and Parmler (2006) find Orcutt's hypothesis in two cases utilizing data of eight countries and the cointegration technique. Similarly, using data from 28 states and the ARDL approach, Bahmani-Oskooee and Kara (2005) find that the M-L condition holds for most of the countries.

Orcutt (1950) states a few issues in foreseeing the devaluation's impact on the trade balance. These issues may be, for example, a solid correlation between income and price that makes it difficult to get their separate impact, error in calculating the indexes for exports and imports (i.e., measurement error), bias and error due to change in demand when we have assumed fixed demand schedule, only focusing on the short-run estimates and ignoring long-run estimates, the export/import demand response more to substantial changes in prices than to the minor changes in price. Keeping the issues mentioned above, he believes that different econometric techniques should be used for different kinds of variations. These issues can be addressed by using industries instead of aggregate trade flow data. By doing so, we can presume that the demand schedule is stable, and only change can occur on the supply side because consumers change their consumption attitude slowly (Orcutt, 1950).

Orcutt's well-known hypothesis is that "albeit the significant varieties in demand are most likely because of changes in the general imports price and the importing country's income,

small changes were because of additional elements. Although small, these changes probably are enormous compared to the impact of changes in variations are impartial of income (Orcutt, 1950)."

Following 3-years of reassessment of the German mark and 1-year of the new rate arrangements at the Smithsonian conference in 1972, the policymakers, researchers, and govt authorities focus on the efficacy of such a policy that isn't affirmed by the empirical work and is analyzed considering several assumptions (Junz and Rhomberg, 1973). The reaction of trade flows to price variation is just a conjecture and has no theoretical underpinning. However, the magnitude of redesign and response time highly attracted practical attention. Junz and Rhomberg (1973) probe this inquiry that would it be advisable for us to think about the disequilibrium in trade flows (trade surplus or deficit) as a failure of the currency rate (exchange rate) re-adjustment or timing matters and the export/imports will react to exchange rate variations in future? To answer this question, they use industrial countries' data and attempt to examine the time response of manufactured goods exports to the variation in the exchange rate and relative prices. Instead of using export values, they use export market shares which do not entirely indicate the effectiveness of a country and variation in relative prices is just one of its determining factors.

The trade flows would respond to the re-adjustment of the 1972 exchange rate in eighteen to twenty-four months. Therefore, a delayed response of trade flows to the exchange rate is expected. These delayed responses of exports and imports can be broken down into five different lags. These lags are recognition and identification lag, decision and choice lag, replacement and substitution lag, and production lag. Once a change takes place in the market, the consumers and producers need time to recognize this alteration. After the economic agents (consumers and producers) identify variation in the market, they need time to decide in order to respond to this change. Even if they take a prompt decision, it needs time to meet the new demand because of delivery lag. Because of the past orders, they have to wait to make new orders by replacing materials that assist them with staying competitive in the global market. Finally, producers decide whether they should produce by upgrading production methods or quitting the market.

Junz and Rhomberg (1973) use the data of thirteen developed states (the United States, the United Kingdom, Canada, Austria, France, the federal republic of Germany, Belgium-Luxembourg, the Netherlands, Italy, Denmark, Japan, Norway, and Sweden) and measure the response of market share to the variations in the exchange rate and variation in price by imposing five lags. They find that the response of market shares to price takes more time than

the researchers assumed and takes approximately four to five years. Their results for exchange rate are no different than of price; nevertheless, the outcome can't be applied to a specific country since they use pooled data.

Wilson and Takacs (1979) stressed the importance and implication of trade flows' reaction pace to exchange rate change and relative price change. They criticize Junz and Rhomberg (1973), which was the first study to test Orcutt's hypothesis empirically for its several shortcomings. For example, they use market share instead of using trade flows directly. Second, they pool the data and enforce an identical parametric limitation on every country in the pool.

Wilson and Takacs (1979) analyze trade flows' reaction to price variations and relative exchange rates to address the issues mentioned above. For this purpose, they used quarterly data from six high-income countries in the Bretton woods phase (1957-1971) (The United States, the United Kingdom, Germany, Japan, France, and Canada). Incorporating exchange rate and price in the export and import demand equations, they get long-run coefficients by summing up the various lags of price and exchange rate relying on logarithms of trade flows demand equation. Because of the absence of econometric norms to pick among various models, they impose a lag length of 4, 6, 8, 10, and 12 on the exchange rate and price and pick the last model conditional upon the statistical significance and lags' signs of exchange rate and price variable. By and large, their results indicate expected signs for the regressors except in the case of the United Kingdom and Germany. The results of the imports demand equation reveals that it does not respond to price and exchange rate in the case of Canada, the United Kingdom, and France. As a whole, their results confirm the confirmation of Orcutt hypothesis, where trade flows respond quicker to exchange rate than to relative price. Nonetheless, the outcomes didn't infer the extent of the measurements of prices and exchange rate. Their analysis also has shortcomings as they just focus on fixed exchange rate periods. However, Wilson and Takacs (1979) think their outcomes are still suitable for floating rates.

Criticizing the previous studies for using fixed exchange regimes data, Bahmani-Oskooee (1986) addresses this by considering a floating exchange rate period (1973-1980). He uses the same exports and import demand model of Wilson and Takacs (1979) and includes exchange rate, prices, and income as a regressor. He tests Orcutt's hypothesis for seven developing countries (Israel, India, Brazil, Greece, South Africa, Korea, and Thailand) and uses the Almon method to select different lag structures on the exchange rate and relative price. In the first step, he measures the model by imposing lags and dropping the exchange rate or price depending on if they possess unexpected signs or insignificant coefficients. The results

of the import demand equation indicate that relative price possesses a negative and significant coefficient for Thailand, Korea, and South Africa. On the other hand, the exchange rate carries a significant and expected positive coefficient in the case of Greece and Brazil, while getting a negative coefficient for Israel. The economic activity (income) possesses a positive and significant coefficient in all countries except Israel and India. For the export demand equation, the exchange rate possesses a negative and significant coefficient in the case of South Africa, Greece, and Israel. The relative price variable carries a negative and significant coefficient for Israel, Brazil, and India. The income variable has an expected positive and significant coefficient only in the case of South Africa and India, while it possesses a negative and significant coefficient in the case of Israel. As Bahmani-Oskooee (1986) study aims to examine Orcutt's hypothesis, he imposes lags (up to eight) on the exchange rate and relative prices in his second step. He estimates the import and export demand model and finds long-run coefficients according to theory, except for the Brazilian export demand equation. In export and import demand equations, the exchange rate also carries an expected and significant coefficient in most cases. However, the coefficient possesses unexpected signs in some cases, such as Israel's imports, Brazil's exports, Thailand, Korea, and South Africa's imports and exports demand equations. Similarly, the income variable also possesses an expected positive and significant coefficient in most cases. Out of fourteen, he finds evidence of Orcutt's hypothesis in nine cases. In the import demand equation of Thailand, Greece, and South Africa, the exchange rate and relative prices take the same lag length. This indicates the same speed of import flow reaction to exchange rate and relative prices. On the other hand, the relative price takes shorter lags than the exchange rate in the case of Brazil and Thailand's exports to demand equation. This reflects a faster response of export flows to relative prices than to exchange rate, i.e., the opposite of Orcutt conjecture. At large, he supports Orcutt's hypothesis that trade flows react faster to exchange rate than relative prices. Bahmani-Oskooee (1986) results are the same as those of Wilson and Takacs (1979) for developed countries.

Because of fewer researchers' attention and empirical studies in Africa, Tegene (1989) analyzes trade flows' response to variation in the exchange rate and relative prices in seven less advanced African countries (Cote d'Ivoire, Tunisia, Malawi, Mauritius, Kenya, Ethiopia, and Zambia). For this purpose, he uses quarterly data over the period of 1973-1985 and follows the same trade flows model as Bahmani-Oskooee (1986) used to test the Orcutt hypothesis. In the import demand model, he finds the significant and expected coefficients sign for relative price. However, the exchange rate possesses an unexpected negative and significant coefficient in the case of the Malawi and Mauritius import equation. Similarly, the economic activity (income

variable) also carries a significant and positive coefficient in all cases except Malawi. Focusing on the export demand equation, the relative price carries the same results as the import demand equation (i.e., possess a significant negative coefficient) in all cases. The exchange rate results are different for different countries export models. The exchange rate has a negative and significant coefficient in the case of Tunisia, Malawi, Mauritius, and Cote d'Ivoire, whereas it possesses a positive but insignificant coefficient in Kenya and Zambia's export model. The income variable has a positive and significant coefficient only in the export demand model of Tunisia, Kenya, and Ethiopia. Both factors, i.e., exchange rate and relative prices, significantly affect trade flows in the long run. By large, his results support the evidence of the Orcutt hypothesis and find a faster response of trade flows to exchange rate and relative prices. However, Tegene (1989) finds contrary results for Ethiopia using the vector autoregressive (VAR) model. He thinks this technique has some advantages as it can capture the relationship among the variables. He uses VAR and estimates the granger causality of the export demand equation (exchange rate, relative prices, and exports) and the import demand equation (imports, relative prices, and exchange rate). In the imports and export demand equation, the Granger causality test indicates that there exists a one-way relationship running from the exchange rate and relative prices to export flows.

Since the previous studies use non-stationary data, Bahmani-Oskooee and Kara (2003) see their results as spurious and unreliable. They use the autoregressive distributed lag (ARDL) method to address this issue and test the Orcutt hypothesis. Pesaran, Shin, and Smith (1997) use lags of dependent and regressors as instrument variables (IVs) and prove that OLS is still consistent even in the presence of endogenous regressors in the ARDL model. They prove through Monte Carlo simulations that the ARDL technique is still reliable when we have endogenous regressors, regardless of whether the variables are $I(0)$ or $I(1)$ (Pesaran et al., 1997).

Bahmani-Oskooee and Kara (2003) use quarterly data over the period 1973-1998 for eight industrialized countries (Australia, Denmark, Canada, Italy, Germany, France, Japan, and the US) to analyze Orcutt conjecture. Their result showed that price elasticities are less than one, indicating that export and import demands are inelastic. In most situations, the elasticity of the exchange rate has an identical pattern. Income elasticities are larger in the import demand than export demand equation. They find different results for different countries concerning the response of trade flows' response to relative prices and exchange rates. They conclude that the

Orcutt hypothesis does not hold in general, and the response is different for different economies.

In another paper, Bahmani-Oskooee and Kara (2008) analyze the reaction of trade flows to relative prices and exchange rate in developing countries (Columbia, Hong Kong, Pakistan, Greece, Hungary, Israel, Korea, Poland, the Philippines, South Africa, and Turkey). They use the same approach of the ARDL and find identical findings as for developed countries. In the import demand model, they find evidence of the Orcutt hypothesis in the case of Pakistan, Hungary, Columbia, and Poland. In contrast, they find opposite results for Korea, Israel, the Philippines, and Turkey. The results show the identical response of trade flows to exchange rate and relative prices for Hong Kong, Greece, and South Africa. Bahmani-Oskooee and Kara (2008) find the same results for the export demand equation.

Doubting the aggregation biasedness in the previous studies, Bahmani-Oskooee and Hosny (2015) use disaggregated trade flows and test Orcutt's hypothesis for fifty-nine industries that are traded between Egypt and European Union. They apply the same ARDL method and find that 20 industries' imports respond faster to the exchange rate than to the relative prices. Most of these industries have small shares in imports: nevertheless, four industries of twenty are considered large (Scientific apparatus, Manufactures of metals, Vegetable and fruit, and Office machines). The relative price carries shorter lags in nine industries. Four among these nine industries possess high import shares (Machinery specialized for particular industries, Iron and steel, General industries machinery, Telecommunication apparatus). The same response of imports to the exchange rate and the relative price is observed in thirty industries where the exchange rate and the relative price take the same lag length. The largest industry that responds equally to exchange rate and the relative price is "Petroleum and Petroleum related materials." In general, their findings reflect evidence of the Orcutt hypothesis in one-third of the total industries. In the long run results, Egypt's income significantly affects the imports of thirty-two industries. Of these thirty-two, twenty-one industries are negatively affected, indicating Egypt's import substitution policy. The relative price and exchange rate negatively and significantly affect imports of forty-seven and eleven industries, respectively.

Moving to export demand equation, the Orcutt hypothesis is supported in twenty-one industries. Few of these industries (such as General Industrial Machinery, Cork and wood, Road vehicles, and Machinery specialized for particular industries) possess high export shares. Seven industries' exports react faster to relative prices in the remaining industries. In contrast,

thirty-one industries' exports respond with equal speed to exchange rate and relative price, where both variables take the same lag length. The results of the export demand equation also indicate that the Orcutt hypothesis is supported in one-third of the selected industries. The long-run results of the export demand equation show that the trading partner's income (the EU) significantly affects the export flow of thirty-two industries. Eleven of these thirty-two industries are negatively affected, and twenty-one are positively affected. The relative price and exchange rate significantly affect exports of thirty-eight and twenty-four industries, respectively.

In order to analyze whether the estimation techniques can change the results, Bahmani-Oskooee and Ebadi (2015) use the impulse response function (IRF) to test the Orcutt hypothesis in developing countries (Korea, Hong Kong, Pakistan, Turkey, and Thailand). They use quarterly data but different time periods for different countries. Their results indicate that the impulse response function expires sooner to the exchange rate than relative prices and supports the Orcutt hypothesis. They conclude that the IFS and other techniques yield the same results. Furthermore, their findings are identical to the results of developing countries.

From the above literature, we can conclude that the Orcutt hypothesis is not well explored in the East Asia region. Few studies that try to test the Orcutt hypothesis and investigate the response of trade flows to changes in the exchange rate and relative prices in two or three Asian countries also have several drawbacks. There is no study that comprehensively tests the Orcutt hypothesis for all of East Asia's countries to the best of our knowledge. It is important to know which of the two policies, exchange rate and commercial policy, is more suitable for a region with high global trade shares. East Asia's share in world trade significantly increased, mainly due to its exports. East Asia's export shares in the global market reached 30% in 2019, which were 16% in 1980. This increase in their share in global trade is because of a massive investment in the export-driven manufacturing sector because of low production costs. Secondly, most companies assemble their products in East Asia because of their comparative advantage. This high share in global trade flows attracts attention to how the countries can further increase their global competitiveness and improve their export share. Policymakers should know whether they should emphasize commercial or exchange rate policies. For this purpose, they should know whether the trade flows respond faster to changes in the exchange rate or changes in relative prices. We do our research study for this highly trade-intensified region and assess the Orcutt hypothesis for the selected East Asia countries. In our study, we analyze the Orcutt hypothesis by using the Auto-Regressive Distributed Lag (ARDL) bounds testing approach. Apart from this, we also use the Impuls Response Function

(IRF) to explore the hypothesis and get robust results. This study will enable us to know which type of policy would be more effective for these countries to be competitive in the global market.

Table 3.1: Summary of literature review

Author	Period	Country	Methodology	Findings
Junz and Rhomberg (1973)	1953-1969	Thirteen developed states (the United States, the United Kingdom, Canada, Austria, France, the federal republic of Germany, Belgium-Luxembourg, the Netherlands, Italy, Denmark, Japan, Norway, and Sweden)	Measure elasticities of the market shares	Market export shares take more time to respond than the researchers assume.
Wilson and Takacs (1979)	1957-1971	Six developed countries. Canada, Japan, France, Germany, United Kingdom, United States	Measure long-run estimates of import and export model using OLS	In general, their results confirm the confirmation of the Orcutt hypothesis.
Bahmani-Oskooee (1986)	1973-1980	Tests Orcutt's hypothesis for seven developing countries (Israel, India, Brazil, Greece, South Africa, Korea, and Thailand)	Measure trade flows equation and imposes lags on the exchange rate and relative price using OLS.	In large, he finds the support of Orcutt's hypothesis where trade flows react faster to exchange rate than to relative prices.
Tegene (1989)	1973-1980	seven less advanced African countries (Cote d'Ivoire, Tunisia, Malawi, Mauritius, Kenya, Etiopia, and Zambia)	Same methodology as of Bahmani-Oskooee (1986) and the Granger causality test	In large, his results support the evidence of the Orcutt hypothesis and find a faster response of trade flows to exchange rate and relative prices.
Bahmani-Oskooee and Kara (2003)	1973-1998	eight industrialized countries (Australia, Denmark, Canada, Italy, Germany, France, Japan, and the US)	ARDL bound test to cointegration	Find different results for different countries
Bahmani-Oskooee and Kara (2008)	1973-2002	developing countries (Columbia, Hong Kong, Pakistan, Greece, Hungary, Israel, Korea, Poland, the Philippines, South Africa, and Turkey).	ARDL bound testing approach to cointegration	Different results for different countries
Bahmani-Oskooee and Hosny (2015)	1994-2007	Data of 59 industries traded between Egypt and the European Union	ARDL bound test and ECM	Orcutt hypothesis holds in one-third of the industries
Bahmani-Oskooee and Ebadi (2015)	Different time-period for different country	Six developing countries. (Korea, Hong Kong, Pakistan, Turkey, and Thailand)	Impulse response function (IRF)	Exchange rate dies sooner than relative prices, i.e., Support Orcutt hypothesis.

3. Methodology

This section discusses all the methodological aspects that we use to assess the Orcutt hypothesis. The first part of this section describes the export demand and import demand model, i.e., model specification. The second section discusses each variable used in this study, the data sources, and their corresponding measurement unit. The third section describes the methodology to assess the Orcutt hypothesis and the response of trade flows to the changes in the exchange rate and relative prices.

3.1. Model specification

We use the export and import demand model to analyze the Orcutt hypothesis. In this section, we explain both these equations in detail.

3.1.1. Export demand model

Based on the literature, we take income, nominal exchange rate, and relative prices as export and import flow determinants. We follow the log-linear specification of Wilson and Takacs (1979) and Bahmani-Oskooee and Kara (2003) and use the standard import and export demand models as:

$$\ln X_t = \alpha + \beta_1 \ln YW_t + \beta_2 \ln \left(\frac{PX}{PXW} \right)_t + \beta_3 \ln ER_t + e_t \quad (3.1)$$

Whereas X_t indicates export flows, YW_t is world income, $\frac{PX}{PXW}$ represents relative prices, and ER_t shows the nominal effective exchange rate at time t . In equation (3.1), we expect a positive sign for β_1 . We expect this positive sign because the increase in world income indicates increased demand for country i export. For β_2 , we expect a negative sign as the increase in the relative export price will decrease export. Finally, the nominal effective exchange rate negatively affects exports. As we are using a nominal effective exchange rate, it is an index and is constructed in such a way that an increase represents an appreciation of the currency. On the other hand, if currency depreciation occurs, it is likely to enhance the country's exports. Therefore, we expect a negative coefficient for β_3 .

3.1.2. Import demand model

Just like the export demand equation, the import demand equation is given as follows:

$$\ln M_t = \alpha + \delta_1 \ln Y_t + \delta_2 \ln \left(\frac{PM}{PD} \right)_t + \delta_3 \ln ER_t + e_t \quad (3.2)$$

Where M_t is the imports value, Y_t shows the income of the home country, $\frac{PM}{PD}$ represents the import relative prices (domestic prices relative to import prices), and ER_t is the nominal effective exchange rate at time t .

In the above equation, the increase in the home country's income results in enhancing the demand for imported goods. This means a direct relationship exists between import flow and domestic income. So, we expect a positive sign for δ_1 . However, sometimes countries start production of import substitutes when their income increases. In such a case, there may be a negative relationship between imports and a country's income. The relative prices are affected by import and domestic prices. If the import price decreases or the domestic price increases, it negatively impacts the relative price on import flows ($\delta_2 < 0$). Finally, we have a nominal effective exchange rate and expect its negative effect on a country's imports. A depreciation (decrease in the nominal effective exchange rate) of currency makes the imported product expensive in the home country, resulting in a decline in imports. As explained before, a nominal effective exchange rate is designed so that a decrease reflects depreciation. Therefore, we expect a positive relationship between the country's nominal effective exchange rate and imports ($\delta_3 > 0$).

The estimation of equations (3.1) and (3.2) yield only the long-run results. In order to assess the response of trade flows to the changes in relative prices and changes in the exchange rate (i.e., to test the Orcutt hypothesis), we need to impose lags on the right-hand side variables in the import and export demand equation. For this purpose, we need to add short-run results to these long-run results. We do this by using Auto-Regressive Distributed Lag (ARDL) bound test developed by Pesaran, Shin, and Smith (2001) and following Bahmani-Oskooee and Hosny (2015) to adopt the error-correction model that gives the short and long-run results. In the following section, we explain the methodology that we use in our study to analyze the response of trade flows to the changes in the exchange rate and relative prices.

3.2. The variables

This section gives the definition, construction of the variables, and their data sources. Following the literature, we use the variable of exports and imports demand equation (i.e., Domestic GDP, foreign GDP, nominal effective exchange rate, and relative prices). We discuss each of these variables in the following section.

3.2.1. The trade flows of goods and services

Imports and exports that measure the flow of goods and services in the economy are considered two key elements of the country's trade balance. The country needs to equalize its export and import flows to obtain stability in the balance of payment. The country faces a trade deficit if its imports exceed exports. In contrast, a trade surplus occurs if a country's exports exceed its imports. The trade theories suggest that a country's welfare gain increases if it engages itself in international trade. This highlights the importance of these trade flows to be studied theoretically and empirically over time. The best way to analyze these trade flows' future behaviour is to estimate the export and import demand equations. The estimation of these equations enables us to know how exports and imports flow respond to changes in the exchange rate, relative prices, and income level. These elasticities help policymakers to take steps to achieve a country's desired goal.

3.2.2. Income variable

The income variable (domestic and foreign) is one of the main elements that affect the country's trade flows. The economic theories suggest that an increase in domestic income accelerate demand for foreign's manufactured product (increase in imports). In contrast, a rise in foreign income (if a trading partner) expedites the export of domestically produced goods and services and leads to a rise in exports. However, this theoretical relation does not hold in each case in practice. The empirical literature in international economics explains that the degree of variations in trade flows due to the variation in income merely relies on the country's demand elasticity. High-income elasticity means that a slight increase in income brings a more proportionate change in the quantity demand for imported goods and services. This normally occurs in economies that import a higher proportion of production inputs from another country. Furthermore, the imperfect substitution model of trade also says that there exists a direct connexion between a country's exports and its trading partner's income. According to this trade

model, the demand for a country's export increases if economic activities in trading partners increase. Consequently, we expect a positive sign for all the income coefficients. We follow the literature (Bahmani-Oskooee and Ebadi, 2015; Tegene, 1991) and proxy the foreign income by industrial production composition of the developed countries. The data of these variables are available in the International Monetary Fund database (IFS statistics data).

3.2.3. Exchange rate

The exchange rate is also an element that determines the volume of trade flows in any economy. International trade between countries requires monetary payments in foreign exchange, such as the US dollar, Euro, Yen, and the world's other major currencies. It is usually measured as the domestic currency per unit of foreign currency. However, we use the nominal effective exchange rate, which measures the average weighted sum of domestic currency against a basket of foreign currency. The nominal effective exchange rate is constructed in such a way that an increase in its value indicates an appreciation of the domestic currency. According to the Mundell-Flemming model, the exchange rate's appreciation causes a decrease in exports and an increase in that country's imports. On the other hand, depreciation leads to an increase in exports and a decrease in imports. Therefore, the estimation of exchange rate elasticity is essential to make an effective trade policy. It enables the policymakers to know whether the exchange rate depreciation is an appropriate policy for the country or not (Bahmani-Oskooee and Ebadi, 2015; Orcutt, 1950). The exchange rate coefficient depends on the appreciation and depreciation of the currency (i.e., it can be positive or negative). A negative exchange rate coefficient will indicate currency depreciation, which will reduce their import demand and increase export demand. On the other side, a positive coefficient will reflect an appreciation of the currency, resulting in a decline in the export demand and increasing the country's import demand.

3.2.4. Relative prices of exports and imports

Relative price is also considered one of the main determinants of exports and imports flows. Before the addition of income as a determinant, researchers focus just on the estimation of trade elasticities with respect to price elasticity. According to the traditional microeconomic theory, the price determines the demand and supply of a commodity. In international trade, relative prices measure a country's imports and exports competitiveness. Using the general demand law, we expect that the quantity demand of a commodity goes down when the relative

price goes up, *ceteris paribus*. On the supply side, the quantity supply is expected to increase when the relative price of a commodity increases, other things being constant. Thus, we expect a negative coefficient for the relative price as a negative relationship exists between relative prices and demand for trade flows. This type of computation also helps policymakers to know whether the commercial policy could be effective or not. We compute the import relative price as follows:

$$\text{Relative price of Imports} = \frac{PM}{PD} \quad (3.3)$$

Whereas PM and PD show world import prices and domestic prices, respectively. The import unit value index of advanced economies proxied the world import prices, while the consumer price index is used for domestic prices.

Table 3.2: Data sources and description of variables

Variable	Data Source	Description/definition	Measurement's unit
Imports	WITS	Imports of goods and services constant at 2010 prices	US dollar
Exports	WITS	Exports of goods and services constant at 2010 prices.	US dollar
World Income (YW)	IFS	Gross domestic product of advanced economies constant at 2010 prices.	US dollar
Domestic Income (Y)	IFS	Gross domestic product of the country constant at 2010 prices.	US dollar
Domestic Import Prices (PD)	IFS	Consumer price index	Index
Domestic Export Prices (PX)	IFS	Producer price index	Index
World Export Price (PXW)	IFS	Export unit value index of the advanced economies.	Index
World Import Price (PMW)	IFS	Import unit value index of the advanced economies.	Index
Exchange Rate	IFS	Unit of foreign currency per unit of the domestic currency.	Index

For the export's relative prices, we compute it as follows:

$$\text{Relative export price} = \frac{PX}{PXW} \quad (3.4)$$

Where PX and PXW are the domestic export prices and world export prices, respectively. The world export prices are proxied by the export unit value index of the developed economies, and domestic export prices are proxied by the producer price index.

3.3. Econometrics methodology

We explain the methodology that we use to assess the Orcutt hypothesis. In the first part, we discuss the unit root property of the variables. After confirming the variables' integration order, we proceed to the Auto-Regressive Distributed Lag (ARDL) model.

3.3.1. Unit root test

Before using the ARDL bound test to cointegration, we need to check the time series's stationarity (unit root).⁶⁸ A data is said to be stationary if its statistical properties (mean, variance, etc.) do not change with time. The Dickey-Fuller (ADF) test is commonly used to test the unit root of a time series. For explanation, we consider the following auto-regressive model as given:

$$Z_t = \phi Z_{t-1} + X_t \omega + \varepsilon_t \quad (3.5)$$

Whereas Z_t is a dependent variable, ε_t is an error term and is supposed to be white noise, ϕ is the parameter to be measured, and X_t is the list of exogenous variables. These exogenous regressors may consist of constant or constant with the trend. The variable has a stationary property if $\phi < 0$. On the other hand, the series is said to be non-stationary if the $\phi \geq 0$. The non-stationary series can be made stationary by taking the difference of the series. Thus we can estimate the Dickey-Fuller test by subtracting Z_{t-1} from the above equation.

$$\Delta Z_t = \rho Z_{t-1} + X_t \omega + \varepsilon_t \quad (3.6)$$

Where, $\rho = \phi - 1$. So, the null and alternate hypotheses of the Dickey-Fuller (DF) test are given as follows:

H₀: There is unit root/non.stationary. i.e. $\rho = 0$

H₁: The series is stationary. i.e. $\rho < 0$

The above model is only valid for AR(1) series. Therefore, the higher order of the AR series will violate the assumption of the white noise of the error term. In such a case, the Augmented Dickey-Fuller (ADF) test is suggested to be used for higher auto-regressive

⁶⁸ This is a necessary step to find out the integration order of the time series before using an ARDL bound test for cointegration. The ARDL bound bounds test can't be used if the variable are stationary of order 2, i.e. I(2).

models. The null and alternate hypothesis of ADF is the same as the conventional Dicky-fuller test. Our study uses the Augmented Dickey-Fuller (ADF) test to identify the integration order of the variables.

3.3.2. Auto-Regressive Distributed Lag (ARDL) bounds test

We use the ARDL bounds testing approach to examine the Orcutt hypothesis, which has certain advantages over the other techniques. The major benefit of employing the ARDL approach is that it can be applied irrespective of having I(0) and I(1). However, it can not be used if the series is I(2) (Pesaran et al., 2001). After getting that no variable is I(2), we convert our equation 3.1 (export demand equation) and proceed with the following ARDL specification:

$$\begin{aligned} \Delta \ln X_t = & \alpha_0 + \sum_{i=1}^n \delta_i \Delta \ln X_{t-i} + \sum_{i=1}^n \eta_i \Delta \ln NEER_{t-i} + \sum_{i=1}^n \lambda_i \Delta \ln RPX_{t-i} + \\ & \sum_{i=1}^n \theta_i \Delta \ln YW_{t-i} + \beta_1 \ln X_{t-1} + \beta_2 \ln NEER_{t-1} + \beta_3 \ln RPX_{t-1} + \beta_4 \ln YW_{t-1} + e_t \end{aligned} \quad (3.7)$$

Similarly, We convert the import demand equation (equation 3.2) and proceed with the following ARDL specification:

$$\begin{aligned} \Delta \ln M_t = & \alpha'_0 + \sum_{i=1}^n \delta'_i \Delta \ln M_{t-i} + \sum_{i=1}^n \eta'_i \Delta \ln NEER_{t-i} + \sum_{i=1}^n \lambda'_i \Delta \ln RPM_{t-i} + \\ & \sum_{i=1}^n \theta'_i \Delta \ln Y_{t-i} + \beta'_1 \ln M_{t-1} + \beta'_2 \ln NEER_{t-1} + \beta'_3 \ln RPM_{t-1} + \beta'_4 \ln Y_{t-1} + e_t \end{aligned} \quad (3.8)$$

The first part that comprises parameters δ_i , η_i , λ_i , and θ_i in equation (3.7), and δ'_i , η'_i , λ'_i , and θ'_i in equation (3.8) show short-run results of export and import demand, respectively. Whereas the second section reflects the long-run relationship with the parameters of β_1 , β_2 , β_3 , and β_4 for equation (3.7), and β'_1 , β'_2 , β'_3 , and β'_4 for equation (3.8). Hence, the null and alternate hypothesis of the export demand equation is given as follows:

$$H_0: \beta_1 = \beta_2 = \beta_3 = \beta_4 = 0$$

$$H_1: \beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq 0$$

In the import demand model, the hypothesis is given as:

$$H_0: \beta_1' = \beta_2' = \beta_3' = \beta_4' = 0$$

$$H_1: \beta_1' \neq \beta_2' \neq \beta_3' \neq \beta_4' \neq 0$$

We estimate the equation (3.7) and (3.8) using ARDL bound test. Pesaran et al. (2001) propose two new critical values for the F test (i.e., I(0) and I(1)) to examine cointegration among the lagged variable. They propose the upper bound I(1) value of the F test, assuming all the variables are integrated of order one, and a lower bound value I(0), considering all variables are integrated of order zero. The variables are supposed to be cointegrated (i.e., long-run relationship) if the value of the F stat is greater than the upper bound value. If the value of the F test is less than the lower bound value, this indicates an absence of a long-run relationship among the lagged variables. Pesaran et al. (2001) explain that cointegration could still exist even if some variables are I(0) and some of them are I(1).

As explained above, we get the short-run results from the first part of the ARDL equation (i.e., the variables in different forms). For this purpose, we use Akaike Info Criterion (AIC) to select the optimum model in ARDL's first step. We need to compare the lags of exchange rate and relative export (import) prices to assess the Orcutt hypothesis. For the validation of the Orcutt hypothesis, the exchange rate should take less lag than the relative prices.

3.4. Robustness check

We also test for robustness check and use Vector Auto-regressive (VAR) analysis to derive the impulse response function (IRF). The impulse response function explores the response of trade flows to one standard deviation shock in relative price and exchange rate. In order to test the Orcutt hypothesis, we examine the behaviour of trade flows demand functions to find out which shock dies sooner than the other one. For the validation of the Orcutt hypothesis, the impact of one standard deviation shock in the exchange rate expires earlier than one standard deviation shock in relative price. Otherwise, we reject the Orcutt hypothesis.

3.4.1. Impulse response function

In order to assess the Orcutt hypothesis, the particular interest is to analyze the response of trade flows to changes in the exchange rate and relative prices. The impulse response

function has become a common technique that enables us to explore the reaction of a dynamic system in response to some exogenous shock. We can give a single shock of one unit standard deviation in a variable and can explore its impact on other variables at a specific time period by setting all errors in other periods equal to zero in the dynamic system, which comprises lags of explanatory variables (Koop et al., 1996).

For example, if K-dimensional VAR(p) is stationary with coefficients (A_i):

$$X_t = A_1 X_{t-1} + \dots + A_p X_{t-p} + u_t. \quad (3.9)$$

Or, we can write in vector moving average form:

$$X_t = \mu + \sum_{i=0}^{\infty} \phi_i \mu_{t-1}. \quad (3.10)$$

In the above equation, ϕ is identity matrix can be measured recursively using:

$$\phi_i = \sum_{j=1}^i \phi_{i-j} A_j. \quad (3.11)$$

Here ϕ is the moving average coefficient (with the j th column) and comprises each variable's impulse responses representing each variable's reaction to a one-unit shock to the J th variable in the system (Luetkepohl, 2005).

The impulse response function measures the impact of a variable's particular error on another variable in the system. However, these error terms should be uncorrelated using Cholesky decomposition.

4. Results and discussion

In this section, we present the results of several tests conducted in this study. First, the Unit Root (ADF test) results are given in table 3.3 to confirm the variables' integration order (i.e., the stationary of the variables). This step aims to verify that no variable in our study is I(2). After confirming the variables' integration order, we proceed to step two and present the ARDL bound test results. We present the short-run and long-run export demand equation results in Tables 3.4 and 3.5, respectively. Similarly, table 3.6 and 3.7 present the short-run and run estimates of the import demand equation.

4.1. Unit root test

We use the Augmented Dickey-fuller (ADF) test to check for the unit root using the Akaike Info criterion (AIC) for the lag selection. The test is performed using two different models: the first takes intercept only, and the second considers intercept and trends.

In table 3.3, we present the results of the ADF unit root test. The World GDP and each country's GDP are non-stationary in level and become stationary at first difference. Out of eight countries, the variable exports, imports, and relative imports prices are non-stationary in level at a 5% level of significance. However, all these become stationary once we take their first difference. The relative export prices possess the stationary property of $I(1)$ in all cases except the Philippines, where it is stationary at the level of 5%. The nominal effective exchange rate is $I(1)$ in six out of eight cases. In the case of Japan, the nominal effective exchange rate is stationary in level at a 5% level of significance. Singapore's nominal effective exchange rate is stationary in level when we take constant and trend, but non-stationary when we consider only constant. As the ADF unit root test results confirm that the variables are either $I(0)$ or $I(1)$, we can proceed to ARDL bound approach to cointegration.

Table 3.3: The unit root test

Augmented Dickey-fuller test				
Countries and Variables	Level (P-value)		1st difference (P-value)	
	Constant, no trend	Constant, trend	Constant, no trend	Constant, trend
World GDP	0.348	0.957	0.009***	0.014**
Hong Kong				
Exports	0.069*	0.326	0.001***	0.002***
Imports	0.087*	0.334	0.001***	0.003***
GDP	0.355	0.851	0.003**	0.009**
Nominal Effective Exchange rate	0.088*	0.194	0.008**	
Relative Export Prices	0.620	0.979	0.003**	
Relative Imports Prices	0.292	0.599	0.000***	0.024**
Japan				
Export	0.277	0.594	0.000***	0.001***
Imports	0.548	0.790	0.000***	0.002***
GDP	0.268	0.353	0.001***	0.003***
Nominal Effective Exchange rate	0.006***	0.019**	No Test	No Test
Relative Export Prices	0.479	0.016**	0.002***	No Test
Relative Import Prices	0.001***	0.073*	No Test	0.001***
Korea				
Export	0.271	0.988	0.001***	0.001***
Imports	0.497	0.777	0.000***	0.002***
GDP	0.002***	0.998	No Test	0.004***
Nominal Effective Exchange rate	0.157	0.400	0.002***	0.000***
Relative Export Prices	0.509	0.333	0.000***	0.001***
Relative Import Prices	0.346	0.164	0.000***	0.001***
Malaysia				
Export	0.080*	0.622	0.000***	0.001***
Imports	0.184	0.371	0.001***	0.002***
GDP	0.873	0.130	0.009***	0.014**
Nominal Effective Exchange rate	0.709	0.110	0.005***	0.029**
Relative Export Prices	0.782	0.429	0.000***	0.000***
Relative Import Prices	0.110	0.199	0.001***	0.001***
The Philippines				
Export	0.066*	0.775	0.000***	0.002***
Imports	0.353	0.383	0.003***	0.008***
GDP	0.998	0.173	0.016**	0.043**
Nominal Effective Exchange rate	0.585	0.906	0.001***	0.004***
Relative Export Prices	0.596	0.004***	0.009***	No Test
Relative Import Prices	0.571	0.263	0.000***	0.001
Thailand				
Export	0.142	0.860	0.002***	0.003***
Imports	0.638	0.633	0.001***	0.005***

GDP	0.266	0.104	0.013***	0.041**
Nominal Effective Exchange rate	0.659	0.723	0.000***	0.004***
Relative Export Prices	0.837	0.401	0.001***	0.001***
Relative Import Prices	0.283	0.135	0.004***	0.000***
Singapore				
Export	0.216	0.948	0.004***	0.007***
Imports	0.490	0.665	0.000***	0.003***
GDP	0.136	0.933	0.003***	0.004***
Nominal Effective Exchange rate	0.259	0.010*	0.006***	No Test
Relative Export Prices	0.062*	0.150	0.004***	0.013**
Relative Import Prices	0.096*	0.335	0.001***	0.015**
China				
Export	0.260	0.993	0.003***	0.005***
Imports	0.213	0.989	0.012**	0.020**
GDP	0.253	0.997	0.004***	0.001***
Nominal Effective Exchange rate	0.162	0.084*	0.002***	0.004***
Relative Export Prices	0.433	0.782	0.011**	0.002***
Relative Import Prices	0.328	0.472	0.045**	0.021**

The values in this table are the P-values of the Augmented Dickey-Fuller test. The ***, **, and * shows significance at 1%, 5%, and 10% level of significance, respectively. No test reflects that the variable is already stationary. So, there is no need to take its first difference.

4.2. Result of the ARDL bounds test and Orcutt hypothesis

As explained in the methodology section, we use ARDL bound test developed by Pesaran et al. (2001) and follow Bahmani-Oskooee and Hosny (2015) error-correction specification. We estimate our equations (3.7) and (3.8) for each country using annual data over the period of 1990 to 2020. As we are dealing with annual data, we impose a maximum of 3 lags and use Akaike Info Criterion (AIC) to choose an optimum model. We report the export demand equation results in tables 3.4 and 3.5, whereas the import demand equation results are given in tables 3.6 and 3.7.

4.2.1. Export demand model

First, we concentrate on the export demand model (equation 3.7) and report the short-run results of the nominal effective exchange rate and relative export price in table 3.4. These results are used to assess the Orcutt hypothesis. From table 3.4, we gather the information that the nominal effective exchange rate takes shorter lags than the relative price in five out of eight cases. This indicates that these countries' export flows respond faster to the changes in exchange rate than to the changes in relative price: i.e., they support the Orcutt hypothesis.

These countries include Hong Kong, Korea, Malaysia, Thailand, and Singapore. These countries can focus on their exchange rate policy to gain competitiveness in international trade. For example, a depreciation of their currency makes their export less expensive for foreigners and can increase demand for their export.

On the contrary side, the relative export price takes shorter lags than the nominal effective exchange rate in only one case. This relationship can only be seen in the Philippines case. In such a case, the depreciation of currency will not be effective in improving the country's export flows. Therefore, policymakers can focus on the relative export price to enhance competitiveness in the international market.

Table 3.4: Short-run results of the export demand model

Countries	Nominal Effective Exchange rate				Relative Export Prices			
	0	1	2	3	0	1	2	3
Hong Kong	-0.70*** (5.5)				-0.07 (1.12)	-0.30*** (2.95)		
Japan	0.46** (0.18)	-0.76*** (0.21)	-0.31*** (0.20)	-0.25*** (0.12)	-0.07 (0.12)	-0.28 (0.17)	-0.05 (0.45)	-1.12* (0.54)
Korea	-0.20** (0.09)				-0.28* (0.16)	-0.49* (0.26)	0.38 (0.30)	
Malaysia	-0.81*** (0.24)				-0.14 (0.17)	-0.42** (0.21)	0.39 (0.23)	
Philippines	-0.47 (0.20)	-0.22 (0.27)	0.31 (0.25)	0.68*** (0.23)	0.14 (0.13)	-0.21 (0.16)	-0.29** (0.13)	
Thailand	0.67*** (0.21)				0.04 (0.14)	0.39** (0.17)	0.84*** (0.29)	
Singapore	-1.39* (0.76)	-1.28* (0.73)	-1.32* (0.72)		-0.37* (0.20)	-0.16 (0.26)	-0.92** (0.38)	1.47** * (0.40)
China	-0.05 (0.28)	0.12 (0.28)	-0.70** (0.30)	-0.55** (0.21)	-0.05 (0.20)	-0.49* (0.25)	-0.50** (0.24)	0.75** (0.34)

Notes:

The numbers next to the coefficients and inside the parenthesis are the standard error.

The significance at 1%, 5%, and 10% are represented by ***, **, and *, respectively.

The optimal models are selected using Akaike Info Criterion (AIC). The Orcutt hypothesis is judged by comparing these lag lengths.

In table 3.4, we find that the trade flows react equally to the nominal effective exchange rate and relative prices and changes in relative prices in two cases. The nominal effective exchange rate and relative export price take equal lag lengths in this case. These countries are Japan and China, which have a high share in world export. This result indicates that exchange rate and relative price affect their export flows equally, and both should be considered during policymaking.

4.2.1.1. Long-run results of export demand equation and diagnostic statistics

Table 3.5 presents the long-run results along with the crucial diagnostics statistics. We need to establish the cointegration among the lagged-level variables for these long-run results to be valid. As explained in the methodology section, we use ARDL bound test for cointegration purposes and report the F test value. Given the lower and upper bound critical values, the joint significance of the lagged level variables indicates that the F-stat value is greater than the critical value of 4.35 in seven out of eight cases and reveals cointegration among these variables at 5%. In one case (i.e., Korea), the value lies between the upper and lower critical bound values. The results are inconclusive in such a case.⁶⁹

In table 3.5, we find that the world GDP significantly affect the export of these East Asia countries. This is because of the fact that the increase in income enhances the demand for imported goods. So, the world imports more from East Asia as its income increases. Similarly, the nominal effective exchange rate also significantly affects the exports of East Asia countries. The nominal effective exchange rate carries the expected negative and significant sign in six cases, whereas it takes a positive sign in two cases. Similarly, we find the relative export price is also an important determinant of the export flows in the long run as it carries a significant coefficient in five cases.

We use the normalized run estimates of the export demand model (equation 3.1) and calculate error-correct (ECM). We report the value of the lagged error-correction term (ECM_{t-1}) in table 3.5, which is another way to establish cointegration and show the adjustment speed. This enables us to know whether the short-run equilibrium converges into the long-run or not. The results confirm that the ECM_{t-1} value in all cases is negative and highly significant, indicating converges of the short-run estimates into the long-run. For instance, if we consider Hong Kong, the value is -0.49, indicating that 49% adjustment occurs each year.

We also present a few additional diagnostic statistics in table 3.5. We use the Lagrange multiplier (LM) test of residual correlation to ensure that all the models are free of serial correlation and report the results. The LM test is a chi-square (χ^2) distribution with twelve degrees of freedom. Given the critical value of the F stat, we find that all our models are free of serial correlation. Furthermore, we need to check whether the optimum models are correctly specified or not. For this purpose, we use the Ramsey RESET test which is also a chi-square

⁶⁹ We also use the lagged ECM value, which is another way to establish cointegration. We discuss it in the later part of this section.

distribution test with a certain degree of freedom. The Ramsey RESET values indicate that the models are correctly specified in all cases.

We also need to check the stability of these error correction models employing the cumulative sum of recursive residuals (CUSUM) and their square (CUSUM Square) test (Brown, Durbin, and Evans, 1975). Both these tests assess the stability of the model using the recursive residual of the recursive parameters. In CUSUM and CUSUM square, the model stability is rejected if the statistics lie outside the interval. Instead of presenting each model's CUSUM and CUSUM square figures, we just denote the stable model by S. We gather from table 3.5 that both these tests indicate a stable model in all cases. In the last column, we present the adjusted R-square value, which indicates that all the models enjoy a good fit.

Table 3.5: Long-run results and diagnostic statistics of export demand model

Variable and Diagnostics Country	GDP	Nominal Effective Exchange rate	Relative Export Price	F-stat	ECM _{t-1}	LM	RESET	CUSUM	CUSUM Square	Ad R2
Hong Kong	2.56*** (0.12)	-1.42*** (0.21)	0.45** (0.18)	13.83	-0.49*** (0.02)	0.09	2.63	S	S	0.86
Japan	9.17*** (3.15)	-1.83** (0.90)	9.29 (7.54)	6.73	-0.32*** (0.12)	0.79	0.62	S	S	0.85
Korea	3.24*** (0.38)	-0.55* (0.29)	-1.57 (0.92)	3.46	-0.38*** (0.09)	0.06	1.13	S	S	0.63
Malaysia	2.88*** (0.34)	-1.21*** (0.32)	-1.43*** (0.35)	7.09	-0.67*** (0.11)	2.81	0.10	S	S	0.68
Philippines	3.83*** (0.23)	1.57*** (0.31)	0.89*** (0.15)	8.64	-0.73*** (0.11)	2.03	0.98	S	S	0.85
Thailand	1.84*** (0.35)	-1.06*** (0.18)	-2.03*** (0.34)	5.58	-0.63*** (0.12)	0.74	0.42	S	S	0.73
Singapore	5.09*** (1.26)	-2.01** (0.98)	-2.01*** (0.74)	9.58	-0.36*** (0.05)	1.42	0.02	S	S	0.78
China	12.92* (7.31)	2.40** (1.15)	6.17* (3.62)	5.51	-0.28*** (0.01)	1.43	2.20	S	S	0.72

Notes:

The significant coefficient are represented by ***, **, and * at 1%, 5%, and 10% respectively.

The numbers next to the coefficients (inside parenthesis) are the standard errors.

For the joint significance, the upper bound value at 5% level of significance is 4.35 and the lower bound value is 3.23. On the 10% level of significance, the upper bound value is 3.77 and the lower bound value is 2.72.

LM: It represents the Lagrange multiplier test used to check serial correlation of the residual.

RESET: It represents the Ramsey RESET test and is used to check whether the model are correctly specified or not.

CUSUM and CUSUM Square are used to check the stability of the estimates.

4.2.2. Import demand model

We follow the same procedure for the import demand model as we did in estimating the export demand equation and report the results in table 3.6. First, we present the short-run result and analyze the Orcutt hypothesis. For this purpose, we just focus on the lag structure on the nominal effective exchange rate and relative import price. The Orcutt hypothesis is valid if the nominal effective exchange rate takes shorter lags than the relative import price. Table 3.6 gathers the information that the nominal effective exchange rate takes shorter lags and confirms the Orcutt hypothesis in five out of eight cases. The countries whose imports react faster to changes in exchange rate than the relative import price changes (i.e., support Orcutt hypothesis) are Hong Kong, Korea, Malaysia, Thailand, and China.

Table 3.6: Short-run results of the import demand model

Country	Nominal Effective Exchange Rate				Relative Import Prices			
	0	1	2	3	0	1	2	3
Hong Kong	0.98*** (0.26)	0.75*** (0.35)	0.54** (0.25)		0.06 (0.05)	0.05 (0.08)	-0.03 (0.13)	-0.24* (0.13)
Japan	0.92*** (0.24)	0.92** (0.33)	0.54* (0.29)	0.40** (0.19)	-0.14 (0.13)	-0.57*** (0.16)		
Korea	0.10 (0.13)				-0.23 (0.17)	0.67*** (0.18)		
Malaysia	0.15** (0.07)				-0.19* (0.11)	-0.54*** (0.15)		
Philippines	0.40** (0.19)	-0.09 (0.21)	-0.40 (0.25)	0.36** (0.17)	0.01 (0.18)	-0.36*** (0.11)	-0.58** (0.24)	-0.66*** (0.19)
Thailand	0.41 (0.27)				-0.03 (0.20)	0.65*** (0.20)	1.15** (0.42)	-0.70 (0.46)
Singapore	-0.22 (1.17)	0.39 (1.51)	1.18 (1.37)	2.34** (1.03)	0.04 (0.15)	0.24 (0.18)	0.22 (0.40)	0.47 (0.41)
China	-0.43 (0.35)	-0.13 (0.32)	0.48** (0.23)		-0.25 (0.16)	0.34 (0.24)	-0.40 (0.39)	0.67** (0.32)

Notes:

Number next to the coefficient and inside the parenthesis are the standard error.

The significance at 1%, 5%, and 10% are represented by ***, **, and *, respectively.

The optimal models are selected using Akaike Info Criterion (AIC). The Orcutt hypothesis is judged by comparing these lag lengths.

On the other hand, the relative import price takes fewer lags than the nominal effective exchange rate in only one case. This relationship holds only in the case of Japan's import demand equation. In estimating the import demand equation, we find that the imports react at equal speed to changes in the nominal effective exchange rate and changes in relative import price in two cases. These two countries are the Philippines and Singapore, where exchange rate and relative import price yield the same lag length.

4.2.2.1. Long-run estimates and diagnostic statistics of the import demand model

We also present the long-run results and different necessary diagnostics in table 3.7. From the long-run results, we find that the country's GDP is one of the main determinants of the country's imports. In all models, the GDP carries a positive significant coefficient and indicates that the import demand increases with the increase in their income. Regarding the nominal effective exchange rate, we find the expected positive and significant coefficient in five cases. As we are dealing with the nominal effective exchange rate, the increase in the index value reflects a depreciation of the currency. The currency's depreciation makes the imports less expensive, leading to an increase in the country's import demand. These countries are Japan, Korea, Malaysia, the Philippines, and Thailand. The relative import price holds the expected negative and significant coefficient in four cases. These countries are Japan, Korea, Thailand, and Singapore.

For the above long-run results to be meaningful, we need to determine cointegration among the lagged level variable. We report the F-stat value for this purpose. Considering the F test's lower and upper critical bound value, we find that F statistics is greater than the upper bound value in six cases at 5%. The remaining two cases show a weak cointegration as the F statistics value is greater than the upper bound value at 10%.

Just like the export demand model, we use the normalized long-run estimates of equation (3.2) and calculate the error-correction term. We replace lagged level variable with the lag of the error-correction term (ECM_{t-1}) and estimate the new specification using the same lag length. All the ECM_{t-1} values are negative and significant, indicating a convergence toward long-run equilibrium.

The other necessary diagnostics of the import demand model are also reported in table 3.7. The serial correlation of each model is checked through the Lagrange multiplier (LM) test. The results confirm that all the models are free of serial correlation. The Ramsey RESET test is used to check whether the model is correctly specified or not. The value of Ramsey RESET reveals that all the optimum models are correctly specified. Finally, we use CUSUM and CUSUM square tests to check the stability of the short-run and long-run estimates. The results of both tests show that all the estimates are stable. In the last column, we present the value of the adjusted R square and see all the models enjoy a good fit

Table 3.7: Long-run results and diagnostic statistics of import demand model

Variables and Diagnostics Country	GDP	Exchange rate	Import Prices	F-Stat	ECM _{t-1}	LM	RESET	CUSUM	CUSUM Square	Ad R2
Hong Kong	1.43*** (0.08)	-1.39*** (0.43)	0.47 (0.27)	4.61	-0.55*** (0.12)	1.08	0.006	S	S	0.85
Japan	6.68* (3.97)	3.42** (1.52)	-4.57** (2.04)	4.86	-0.29*** (0.02)	2.60	0.74	S	S	0.75
Korea	1.67** (0.82)	1.03* (0.61)	-4.48* (2.61)	4.24	-0.29*** (0.03)	0.25	0.56	S	S	0.76
Malaysia	1.27*** (0.22)	0.47** (0.23)	1.05 (0.65)	4.98	-0.31*** (0.07)	1.51	1.71	S	S	0.79
Philippines	0.81*** (0.13)	0.62** (0.31)	-0.56 (0.34)	5.52	-0.45*** (0.10)	1.10	3.09	S	S	0.87
Thailand	1.68*** (0.43)	1.15* (0.68)	-2.02** (0.96)	4.96	-0.36*** (0.06)	0.56	0.75	S	S	0.70
Singapore	1.73*** (0.22)	-1.50 (1.01)	-1.50* (0.73)	5.68	-0.65*** (0.12)	2.37	0.48	S	S	0.75
China	1.47** (0.32)	-0.31 (1.97)	1.40 (2.07)	4.06	-0.25*** (0.06)	1.19	0.44	S	S	0.65

Notes:

The significant coefficient are represented by ***, **, and * at 1%, 5%, and 10%, respectively.

The numbers next to the coefficients (inside parenthesis) are the standard errors.

For the joint significance, the upper bound value at a 5% level of significance is 4.35, and the lower bound value is 3.23. On the 10% level of significance, the upper bound value is 3.77, and the lower bound value is 2.72.

LM: It represents the Lagrange multiplier test used to check the serial correlation of the residual.

RESET: It represents the Ramsey RESET test and is used to check whether the model is correctly specified or not.

CUSUM and CUSUM Square are used to check the stability of the estimates.

4.3. Robustness check and Impulse response function

We derive the impulse response function for the robustness check using the Vector Auto-regressive (VAR) analysis. We use Akaike Info Criterion (AIC) to select the optimum lag for VAR analysis. The results of the impulse response function for the export demand equation are given in figure 3.2. These figures show the impact of one standard deviation shock in the exchange rate and relative price in export demand equations. The one standard deviation shock in the exchange rate expires sooner than the relative price in five cases in the export demand function and supports the Orcutt hypothesis. In two cases, the shock in relative prices dies quicker than the exchange rate. Hence, the results are the same and show robustness as it matches our main model results (equation 3.7).

We also analyze the impulse response function (IRF) for the import demand equation and present the results in Figure 3.3. We do the same process as the export demand function and explore the impact of one standard deviation shock in the exchange rate and relative price on the import demand function. In the import demand function, the shock in the exchange rate expires sooner than relative prices in four cases and supports the Orcutt hypothesis. The results match the main results (equation 3.8) except for Malaysia, where the relative price and exchange rate shock never die.

5. Conclusion

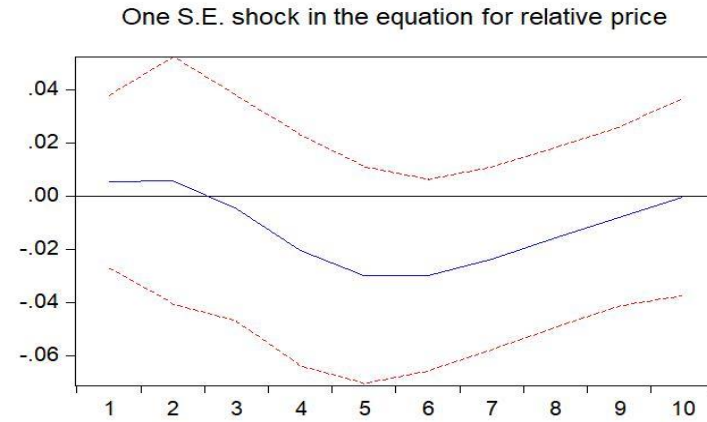
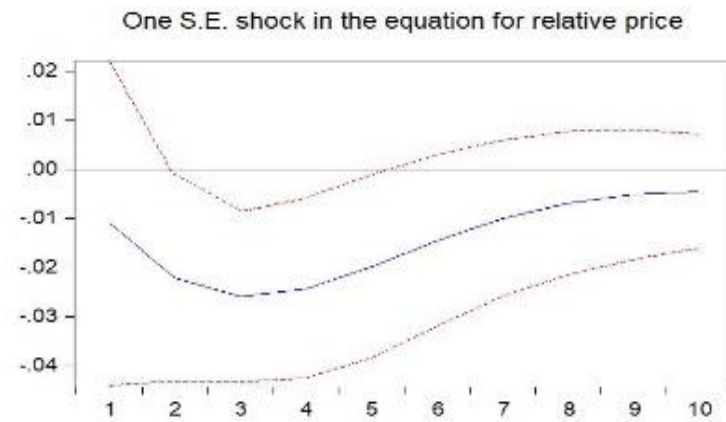
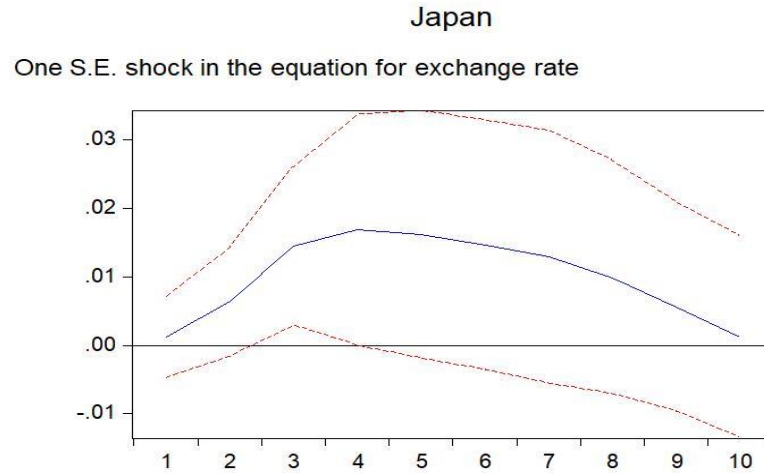
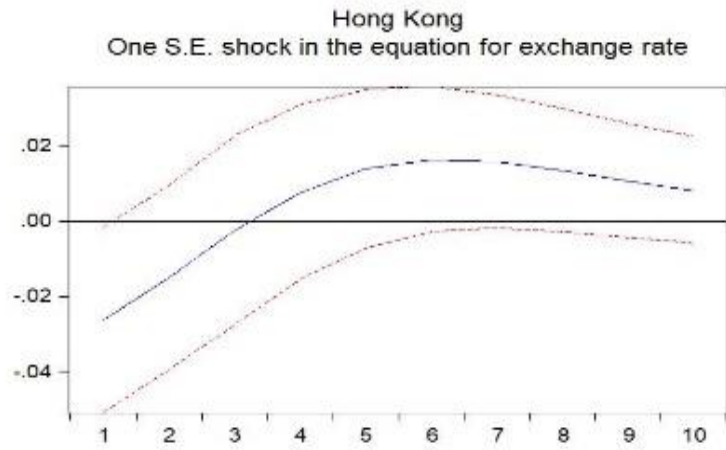
The researcher's focus is to choose an effective policy between exchange rate and relative price after the collapse of the Bretton wood system. For instance, if a country's exports decreased due to slow global growth or other factors, the country needs to use a commercial or exchange rate policy to gain competitiveness in the world market.

The policymakers look at the exports and import elasticities to choose a suitable policy between exchange rate and commercial policy. The commercial policy is said to be effective if the price elasticities are found to be high. On the other side, the commercial policy will not be effective in addressing the shock in trade flows if the prices have low elasticities. In such a case, the depreciation of currency can be used to improve the exports and trade balance of the country. However, Orcutt (1950) believes that trade flows react faster to changes in exchange rate than to changes in relative prices. If this hypothesis holds, the exchange rate depreciation would be a suitable policy to gain competitiveness in the global market and improve the trade balance. Junz and Rhomberg (1973) agree with Orcutt and attribute this delayed response (trade flows to these variables mentioned above) to five economic time lags: i.e. recognition lag, decision lag, delivery lag, replacement lag, and production lag. An economy needs an instant strategic response if the trade flows respond significantly to the changes in exchange rate than to the changes in relative prices. Since these two variables appear to be important factors in trade flows when it comes to policy proposals, it is suggested to use updated data in empirical studies to capture the changing economic conditions.

In our study, we focus on East Asia, which possesses a high trade share in global trade. The 16% share in world exports rose to 30% in 2019. These high shares make it necessary to know which type of policy would be more effective in improving their competitiveness in the global market. For this purpose, we analyze the Orcutt hypothesis in East Asia and examine the response of trade flows to changes in the exchange rate and relative prices. We estimate the export and import demand equation using the data over the period of 1990-2020. In order to test the Orcutt hypothesis, the study uses the ARDL bounds testing approach to cointegration and get the short-run and long-run results of the exports and imports demand equation. The study results reveal that exports of five countries respond faster to the changes in exchange rate than relative price, i.e., support the Orcutt hypothesis. These countries are Hong Kong, Korea, Malaysia, Thailand, and Singapore. Similarly, the estimation of the import equation also supports the Orcutt hypothesis in five countries. The countries whose imports respond faster to

the exchange rate than to the relative price are Hong Kong, Korea, Malaysia, Thailand, and China. The study finds only a few cases where the trade flows react faster to the relative price than to the exchange rate. Based on our estimation, it is recommended that countries whose trade flows support the Orcutt hypothesis should focus on their exchange rate policy rather than commercial policy. They can improve their global market competitiveness and achieve their desired goals by concentrating on their exchange rate policy.

Figure 3.2: Impulse response function for export demand equation



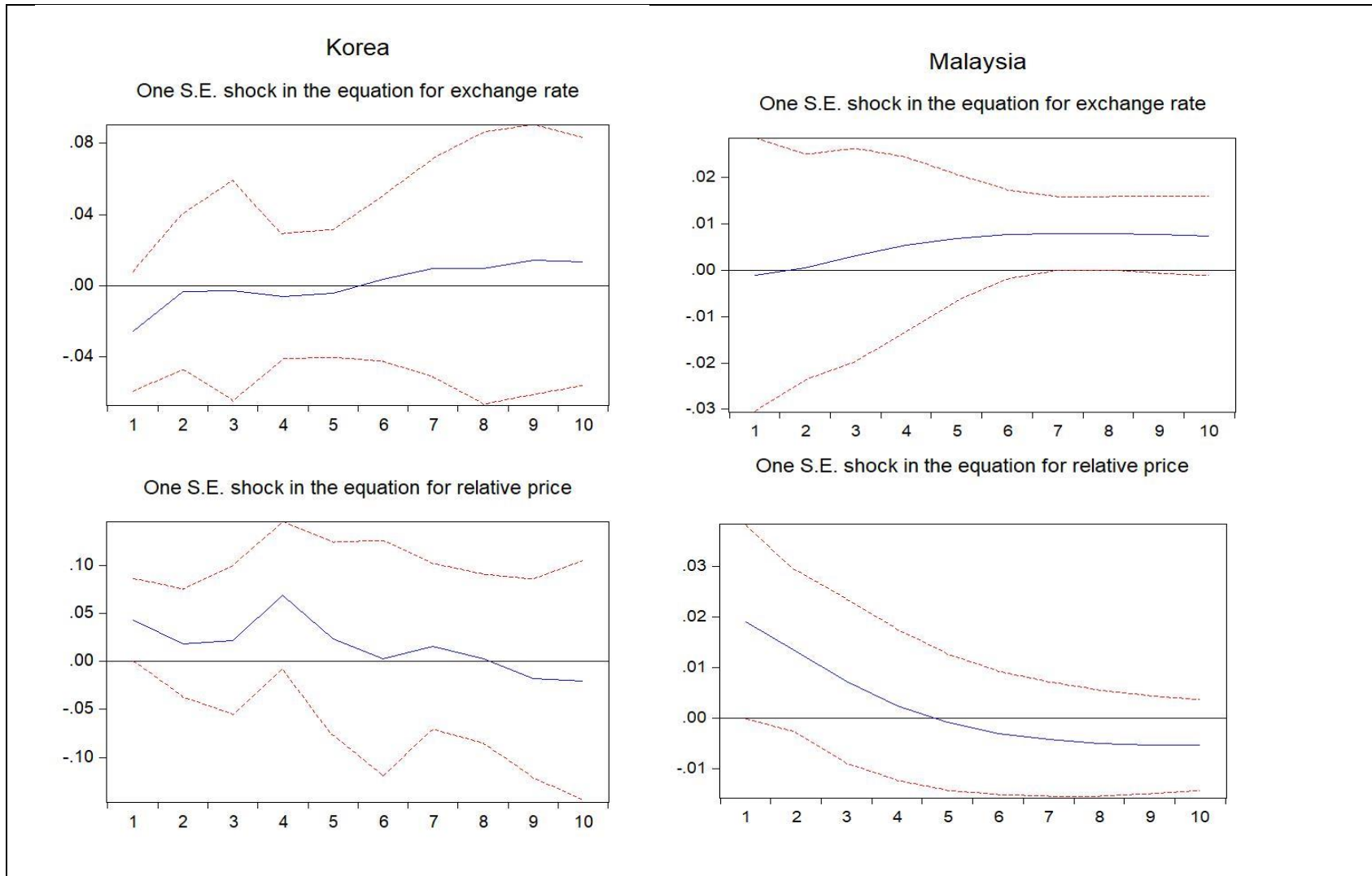


Fig. 3.2. continued

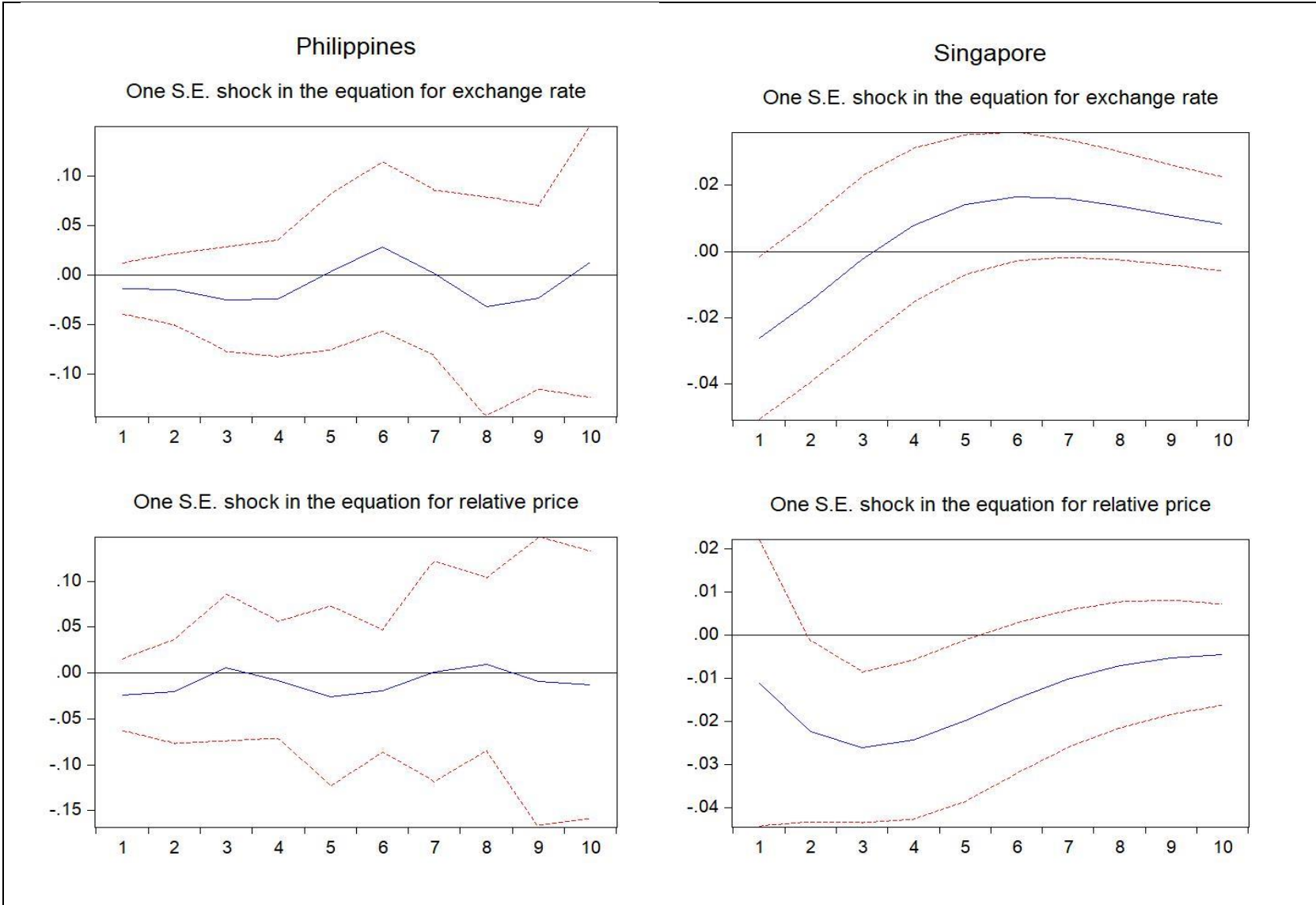
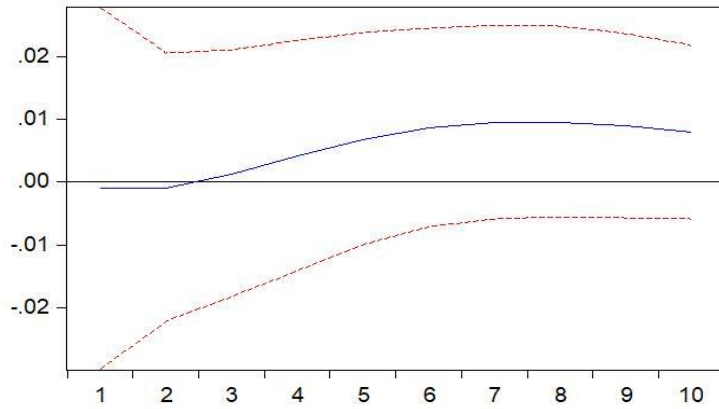


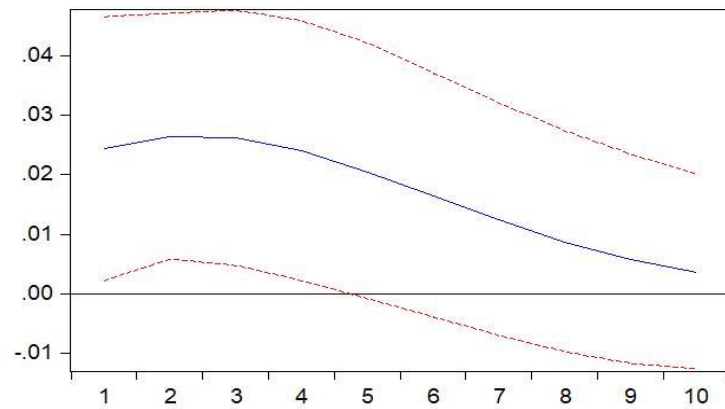
Fig. 3.2. continued

Thailand

One S.E. shock in the equation for exchange rate

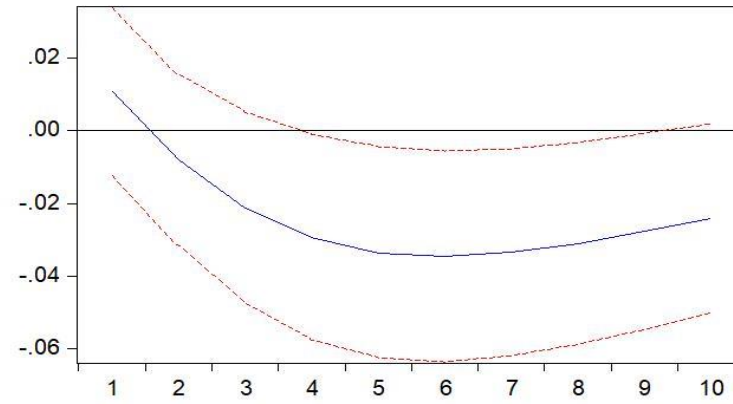


One S.E. shock in the equation for relative price



China

One S.E. shock in the equation for exchange rate



One S.E. shock in the equation for relative price

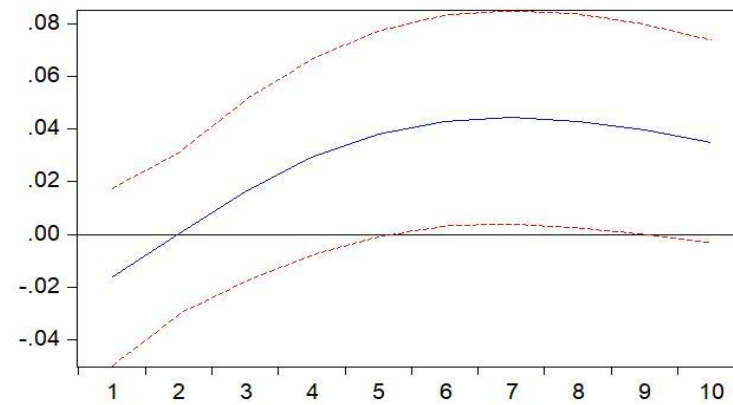
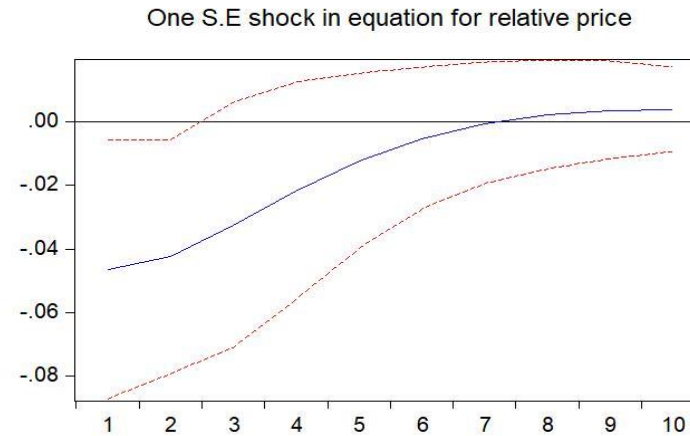
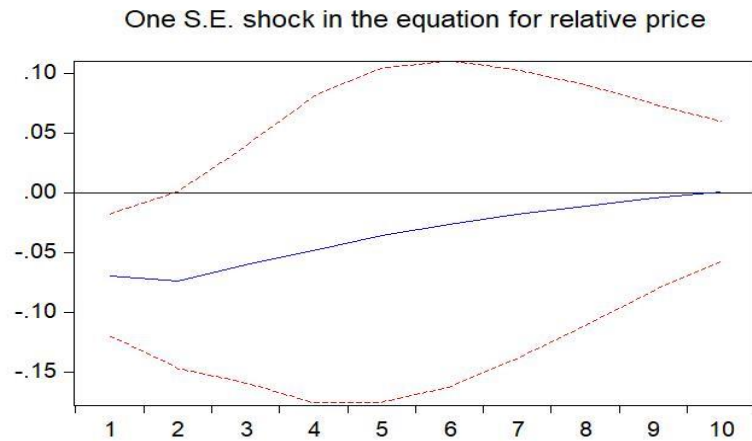
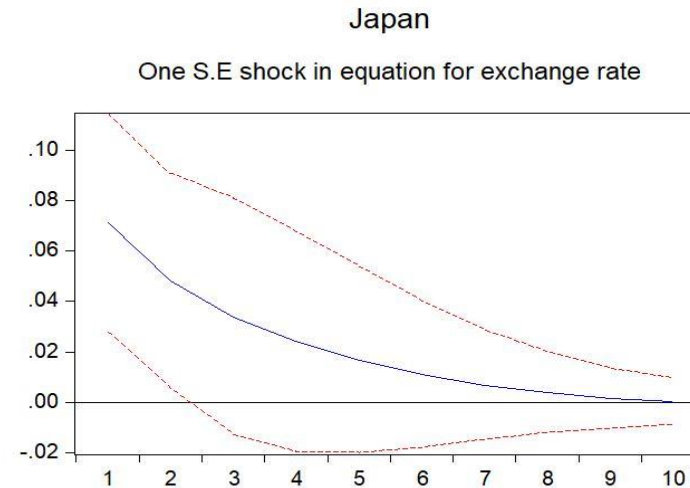
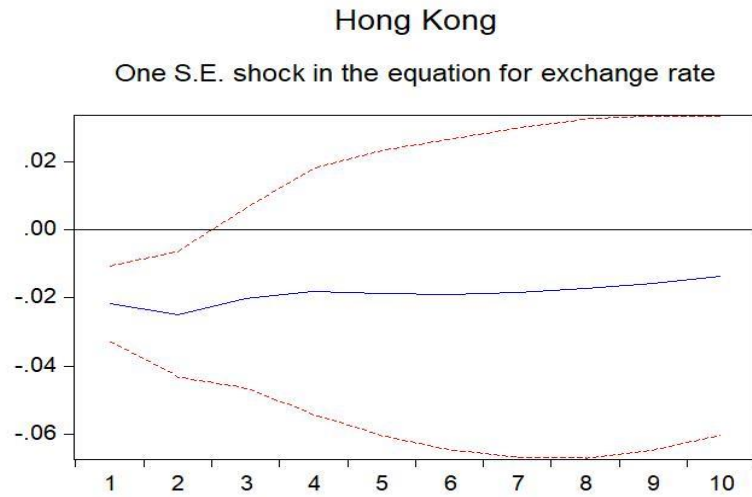


Figure 3.3: Impulse response function for import demand equation



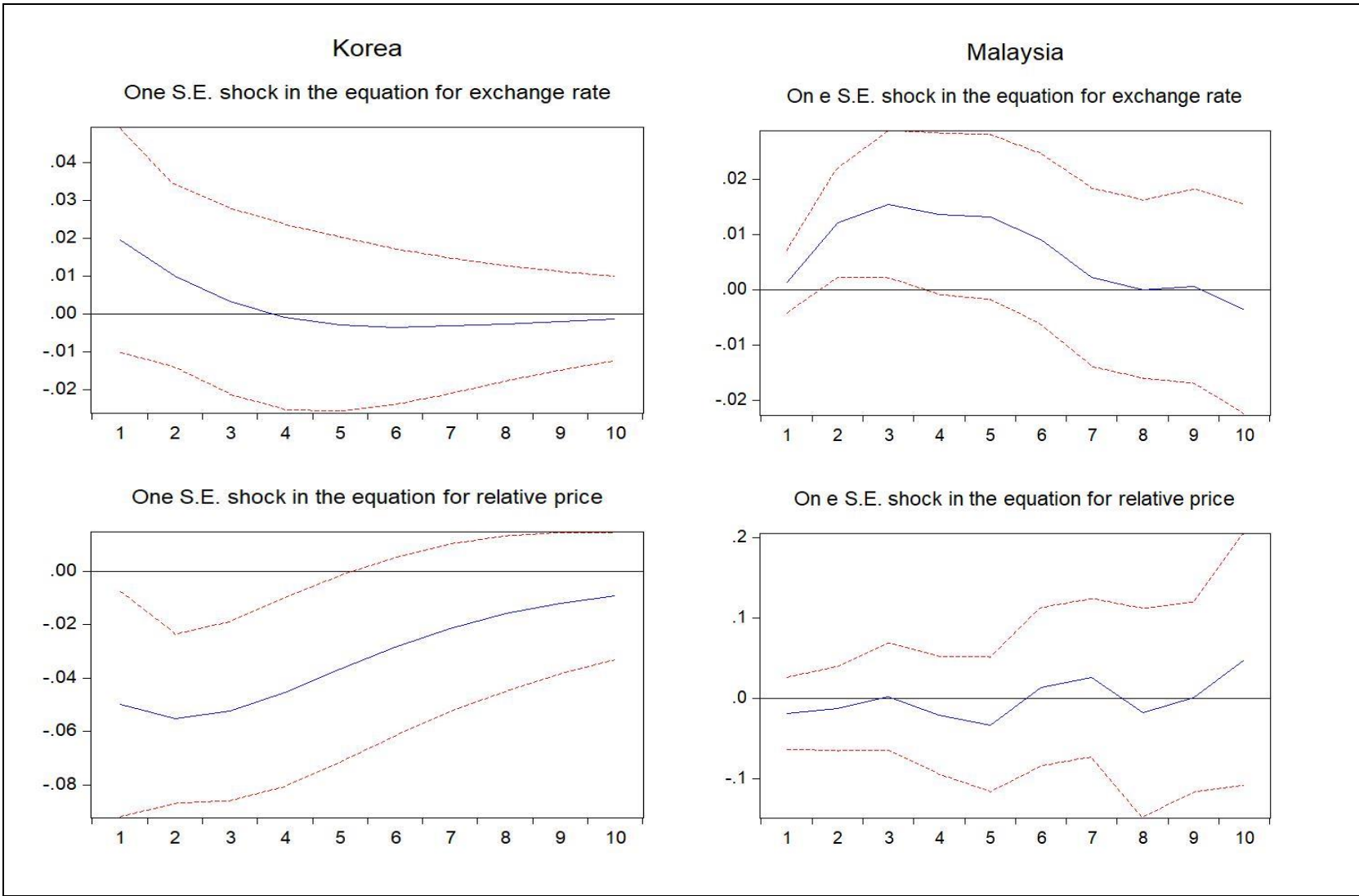


Fig. 3.3 continued

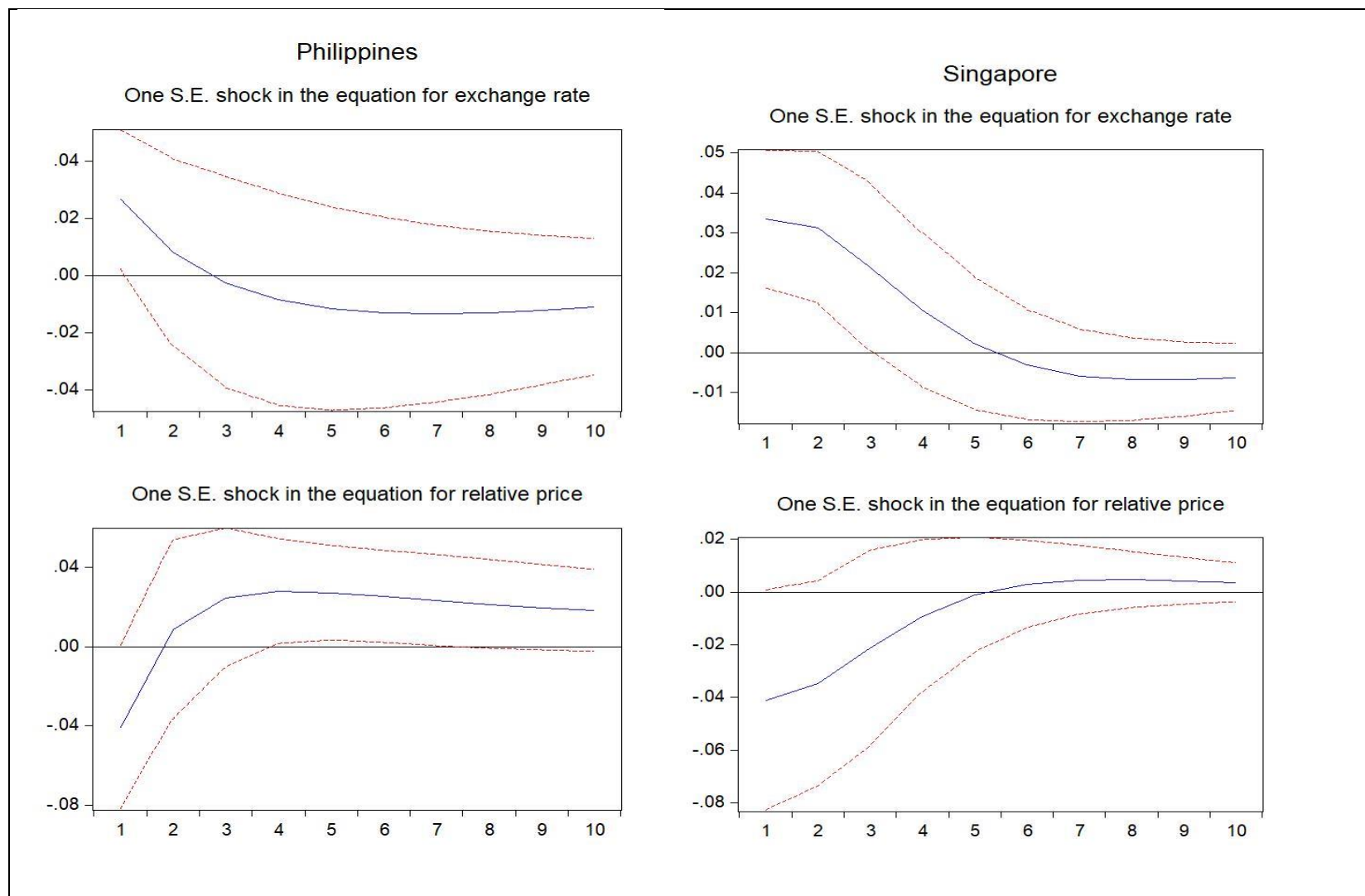


Fig. 3.3 continued

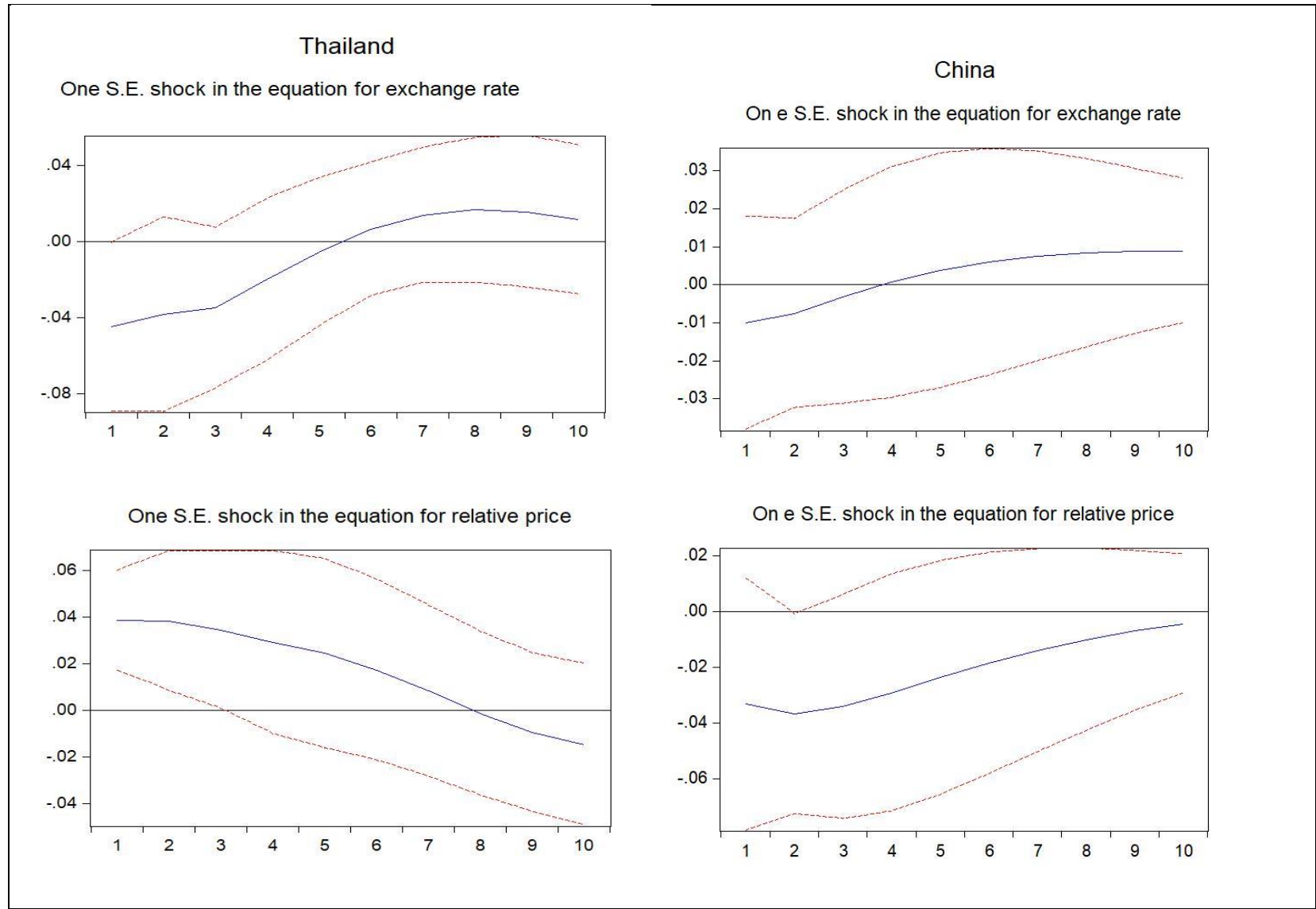


Fig. 3.3 continued

General conclusion

The thesis aims to introduce fresh insights and ideas comprising different aspects of international trade. The subject of this thesis revolves around certain objectives and tries to address these questions. First, we examine the trade integration role of three major regional trade agreements (RTAs) situated in different geographical regions. We investigate how RTAs affect the trade among the member countries and whether it affects the trade of non-members with member countries or not. More specifically, the thesis explores the trade effects resulting from RTAs and focuses on the Vinerian concept concerning trade creation and trade diversion. Second, the thesis examines the nexus between trade intensity and business cycle synchronization and sees the monetary union's possible optimality in East Asia. Apart from this, the study also considers the role of monetary and fiscal policy coordination in the promotion of business cycle synchronization in the region. Third, the study examines the validity of the Orcutt hypothesis in East Asia and examines the response of trade flows to variations in the exchange rate and relative prices. This type of study helps policymakers to choose between commercial and exchange rate policies to be competitive in the global market.

We adopt the empirical approach and address all these objectives in three different chapters of the thesis. The contribution and results help in adopting an effective policy and have academic and public interest.

In the first chapter of our thesis, we examine the ex-post consequences of regional trade agreements (RTAs). We focus on the three major regional trade agreements and measure the trade effects that arise due to the creation of the trade bloc. As international trade plays a vital role in the development of a country, they sign trade agreements and eliminate trade barriers to create trade blocs and increase the welfare impact of trade. As David Ricardo explains in his theory of comparative advantage, a country can increase its income and consumption level by engaging itself in trade. A country gets such advantages through economies of scale, technological innovation, and consumption enhancement that lead to trade creation. Conversely, trade diversion refers to a welfare loss caused by a shift in product form from a lower-cost producer to a higher one. For example, if a non-member state has a comparative advantage in a particular product, the RTA members can manipulate its comparative advantage by imposing a tariff. This imposition of tariffs encourages and protects the inefficient producer

at the cost of an efficient producer. This generates a welfare loss and reduces the volume of traded goods (Viner, 1950).

There are two issues that are not addressed in most of the former studies. These issues are country-pair heterogeneity and the problem of zero-trade flows. The zero-trade issue may arise when there is no actual trade between two countries. The zero-trade value between two distant and small economies could occur because of huge variable and fixed costs. The second reason for the occurrence of zero-trade flows may be the outcome of rounding errors. For example, If the trade flows are measured in thousands of dollars, the trade value may be recorded as zero if it is less than a certain threshold level. In particular, zero-trade values may frequently occur when we use disaggregated trade data. Third, zeros may arise because of missing information that is wrongly registered as zero (Silva and Tenreyro, 2006). In the presence of zero-trade flows, the Ordinary Least Square (OLS) may yield biased and inconsistent results. The log-linearization leads to a drop in the zero-trade flows as its logarithm would be unidentified. In such a case, the problem can be solved by using the Poisson Pseudo Maximum Likelihood (PPML) estimator by estimating the equation in the multiplicative form. Second, the heterogeneity issue can be addressed by introducing the fixed effect. Apart from the above two issues, the former studies analyze the trade effects of RTAs using aggregate trade flows data. They assume uniform effects of tariff elimination or tariff reduction on the different commodities trade flows. In reality, however, various commodities trade flows' responsiveness to changes in tariff may be different. Therefore, we examine the trade effects of RTAs at the disaggregated level along with the aggregate trade flows. Hence, we use the theoretically motivated fixed effect PPML technique to analyse regional trade agreements' trade effects to our aggregate and commodity gravity equation. We measure three types of trade effects of RTA in our analysis. We explore RTA formation's impact on the trade between two member states and between non-member and member states. For this purpose, we use panel data of fifty-five countries over the period of 2000-2018 and analyze the EU, NAFTA, and ASEAN trade effects. Using the fixed effect PPML, we find trade creation for all the selected RTAs using their aggregate trade flows. However, we need to see in detail these trade effects as eliminating trade barriers may have a different response for various products. To study the trade impacts of these RTAs in detail, we move to our disaggregated analysis. The industry-level analyses confirm trade creation in 60% of the EU's industries, whereas 40% reflect trade diversion. The results confirm trade creation in 80% of NAFTA's industries, whereas trade creation is found in all ASEAN's industries. The regional trade agreement results in more trade

creation than trade diversion. These results indicate that countries can increase their welfare gain by joining an RTA. Furthermore, the study also finds a significant impact of the other gravity variables on the trade flows. The GDP and population of both countries significantly determine their bilateral trade. The distance, proxied for the trade cost, possesses a negative sign and significantly affects the aggregate and the disaggregated trade flows.

Chapter two address the second objective of this thesis. Chapter two explains the different Optimum Currency Area (OCA) criteria and sees the optimality of the East Asia region. Chapter two's first objective analyzes the endogeneity theory of the optimum currency area of Frankel and Rose (1998) and explores the nexus between trade intensity and business cycle synchronization. Countries can reduce their transaction costs of traded goods and services by joining a currency union. It would be more beneficial to form a currency union having close trade links. The formation of a currency union may boost trade linkages, and the benefit can increase the cost of joining a currency union. Especially the closer international trade links are projected to affect the business cycle of the trading partners. Countries' business cycles are likely to be considerably different than before after joining a currency union. If the trade is dominated by intra-industry trade or countries observe a common demand shock, it is expected to increase business cycle synchronization across the countries (Frankel and Rose, 1998).

East Asia countries have highly increased regional integration in recent decades, especially trade and foreign direct investment. The volume of inter-regional trade in East Asia is more than 50% of their total trade. Therefore, this thesis analyzes the Optimum Currency Area's endogeneity and explores the nexus between trade intensity and business cycle synchronization in East Asia. We use the data panel data over the period of 2005-2015 to measure the impact of trade intensity on business cycle synchronization in East Asia. In our first step, we calculate the trade intensity using the gross trade data and see whether the gross term's trade intensity drives the business cycle. Our results indicate that the gross term's trade intensity has no role in propagating the business cycle synchronization across countries. This result is because of the fact that gross trade data may be exaggerated due to the double-counting issue. In a region that has a significant share in value-added trade, such as East Asia, the use of gross trade data would be meaningless and misleading. Due to the rapidly increasing importance of the global supply chain, East Asia emerged as the second-largest region that contributed to the total value-added trade of the world in 2015. Due to the global supply chain, the products cross borders several times in the form of intermediate products. As the gross trade

count trade statistics at each border instead of the net value-added, the conventional trade data exaggerate exports' domestic content due to the double counting. Therefore, in our second step, we use the value-added trade data to compute the trade intensity and replace it with the gross term's trade intensity variable. We find the support of Frankel and Rose (1998) hypothesis and obtain that trade intensity in the value-added term significantly affects the business cycle synchronization in East Asia. The rationality why the business cycle moves with value-added trade is that it is value-added exports that contribute to a country's GDP instead of gross exports. The Other important variables, such as intra-industry trade, financial integration, and similarity in economic structure, also significantly determine the business cycle synchronization in East Asia.

Another objective of chapter two is to analyze the impact of policy coordination on business cycle synchronization. The fiscal and monetary policy coordination is expected to enhance the business cycle synchronisation. Although the theoretical link between fiscal policy convergence and business cycle synchronization is not well established, we can develop several ways to develop a theoretical connection between fiscal policy convergence and business cycle synchronization. The fiscally irresponsible countries, i.e., countries having a high budget deficit to GDP ratio, generate an asymmetric fiscal shock. In such a case, countries make reforms and reduce their budget deficit to GDP ratio. This, in turn, reduces the chances of asymmetric fiscal effect and increases the synchronization of its business cycle with other countries. In other words, the convergence of fiscal policy induces co-movements of the business cycle as the responsible fiscal actions are likely to be less idiosyncratic (Nzimande and Ngalawa, 2017). The empirical studies also find that fiscal policy convergence leads to the business cycle synchronisation (for example, Clark and van Wincoop 2001; Shin and Wang 2005; Crespo-Cuaresma et al. 2011; Hauge and Skulevold 2012; Nzimande and Ngalawa, 2017). Similarly, the European Union also highlights the importance of fiscal policy convergence in the Maastricht Treaty signed in 1992. The Maastricht treaty specifies the limits of fiscal deficit for the countries before joining the eurozone. Likewise, a common monetary policy is suggested for the region if it possesses symmetric macroeconomic variations. If the countries share symmetric macroeconomic variations, it would be beneficial for them to join a monetary/currency union and surrender their sovereign monetary. The coordination of monetary policy among the countries generates the synchronization of the business cycle in the region. The monetary policy is one of the key sources of the business cycle, and it is expected that a similar monetary policy of the countries would affect and react to their business cycles

in a similar way, i.e., increase the synchronization of the business cycle. Therefore, we explore the impact of fiscal and monetary policy coordination on the business cycle synchronization in East Asia. Although small, the results reveal significant effects of policy coordination on the business cycle co-movements in East Asia.

The third chapter of this thesis addresses our study's third and last objective. In chapter three, we analyze the Orcutt hypothesis in East Asia. The Orcutt hypothesis reflects that trade flows respond quicker to variations in exchange rate than to changes in relative prices.

Before the fall of the Bretton wood system, the research focus was only to assess the price elasticities of export and import flows, generally known as the Marshall-Lerner condition. The commercial policy was suggested if the absolute sum of exports and imports' price elasticity exceeds one. However, the collapse of the Bretton woods system in 1973 induced researchers to assess the response of trade flows to changes in the exchange rate and relative prices. The policymakers aim to see the effectiveness of relative prices and exchange rate in determining international trade flows. The flexible exchange rate system encourages policymakers to choose an effective policy between relative prices and exchange rate. For example, how a country can increase its competitiveness and increase its exports if there is a slowdown in the international market. In such a situation, the country can decrease its prices by providing subsidies or depreciating its currency to be competitive in the global market. Therefore, it is necessary to know trade flows' response to exchange rate and relative prices to make a suitable policy in the competitive world. Orcutt (1950) was the first who observe that trade flows react sooner to the variation in the exchange rate than they do to the variation in relative prices and that the policy inference of such a relation is not uniform. If the Orcutt hypothesis holds, a country needs to concentrate on the exchange rate policy rather than a commercial policy to manage a trade flow shock. After the postulation of Orcutt (1950), the literature also concludes that trade flows respond faster to changes in exchange rate than to changes in relative prices. As exchange rate and relative prices seem to be essential factors of export and import flows when it comes to policy recommendation, it is proposed that empirical estimates should always be updated with the changing economic structure for better policy recommendations. Therefore, empirical analysis of income, exchange rate, and price elasticities are considered essential determinants for choosing between commercial and devaluation of exchange rate policy.

Since the 1980s, East Asia's share in world trade significantly increased, mainly due to its exports. From 16% in 1980, the East Asia share in global exports rose to 30% in 2019. This

tendency can be justified by a significant investment that resulted in exports-focused manufacturing sectors using the benefit of low production cost, mainly in terms of labor. The region that was import-dependent in the 1980s is now leading the world through its exports. Furthermore, the East Asian countries significantly depreciated their currency in 1997 and made the region more competitive. Therefore, the study aims to analyze the response of trade flows to changes in the exchange rate and relative prices and to choose an effective policy between these two variables in East Asia.

Following the literature, we analyze the Orcutt hypothesis by imposing the lag structure on the nominal exchange rate and relative prices. The acceptance or rejection of the Orcutt hypothesis depends on the lag structure imposed on each variable. The Orcutt hypothesis is accepted in this process if the nominal exchange rate takes fewer lags than relative prices. We use data over the period of 1990 to 2020. We use the ARDL bounds testing approach to export and import demand equations in order to examine the Orcutt hypothesis, which has certain advantages over the other techniques. The major benefit of employing the ARDL approach is that it can be applied irrespective of having $I(0)$ and $I(1)$. Pesaran et al. (2001) propose two new critical values for the F test (i.e., $I(0)$ and $I(1)$) to examine cointegration among the lagged variable. They propose the upper bound $I(1)$ value of the F test, assuming all the variables are integrated of order one, and a lower bound value $I(0)$, considering all variables are integrated of order zero. The variables are supposed to be cointegrated (i.e., long-run relationship) if the value of the F stat is greater than the upper bound value. If the value of the F test is less than the lower bound value, this indicates an absence of a long-run relationship among the lagged variables. Pesaran et al. (2001) explain that cointegration could still exist even if some variables are $I(0)$ and some of them are $I(1)$. We use Akaike Info Criterion (AIC) to select the optimum model and get the short-run results from the ARDL equation. We need to compare the lags of exchange rate and relative export (import) prices to assess the Orcutt hypothesis. For the validation of the Orcutt hypothesis, the exchange rate should take a lesser lag than the relative prices. The results indicate that the nominal effective exchange rate takes shorter lags than the relative price in five out of eight cases. This indicates that these countries' export flows respond faster to the changes in exchange rate than to the changes in relative price: i.e., they support the Orcutt hypothesis. These countries include Hong Kong, Korea, Malaysia, Thailand, and Singapore. In the import demand model, the results reveal that the nominal effective exchange rate takes shorter lags and confirms the Orcutt hypothesis in five out of eight cases. The countries whose imports react faster to changes in exchange rate than the relative import price

changes (i.e., support Orcutt hypothesis) are Hong Kong, Korea, Malaysia, Thailand, and China.

The three chapters of this thesis aim to address deficiencies in the existing literature and have several implications. The first chapter of our thesis contributes to the insight into how regional trade agreements affect the trade between member and non-member countries. The results indicate that regional trade agreement creates more trade creation and less trade diversion. Therefore, the countries should abolish the trade barrier and integrate in terms of trade to increase the welfare impact of trade. For this purpose, the countries should reduce not only their intra-regional trade barriers but also the trade barriers with the rest of the world.

Chapter two analyzes the impact of trade intensity and business cycle synchronization in East Asia. Furthermore, this chapter also explores the nexus between policy coordination and business cycle synchronization. Based on the positive and significant impact of trade intensity, fiscal, and monetary policy coordination on business cycle synchronization, we suggest several suggestions regarding the creation of a monetary unions in East Asia and ASEAN. The region may not yet has adequate momentum to adopt a common regional currency. But the over-dependence of East Asian countries on the dollar may not be useful in the future. The adoption of a common currency will be favorable to solve financial instability faster and more effectively, which will be beneficial for East Asia and the global economy. The economic integration in East Asia has grown fast in recent years, and the adoption of a common currency seems more feasible than 20 years back. The common currency in East Asia will be helpful in addressing financial uncertainty in rapid and effective ways. Apart from the trade integration, the East Asia region should reduce the volatility in their exchange rate and enhance policy coordination to promote business cycle synchronization.

The third chapter explores the Orcutt hypothesis in East Asia and addresses the third objective of our thesis. The results reveal that, in most cases, trade flows respond faster to changes in the exchange rate and relative prices in East Asia. Based on our estimation, it is recommended that countries whose trade flows support the Orcutt hypothesis should focus on their exchange rate policy rather than a commercial policy to be competitive in the global market. This policy can also be helpful in adjusting the country's trade balance deficit issue.

Conclusion générale

La présente thèse a pour but d'offrir de Nouvelles perspectives sur certaines implications du développement du commerce international. Le sujet de cette thèse s'articule autour de certains objectifs et tente de répondre aux questions issues de ces objectifs. Tout d'abord, nous examinons le rôle d'intégration commerciale de trois grands accords commerciaux régionaux (ACR) situés dans des régions géographiques différentes. Nous étudions comment les ACR affectent le commerce entre les pays membres et s'ils affectent ou non le commerce des pays non membres avec les pays membres. Plus précisément, la thèse explore les effets commerciaux résultant des ACR et se concentre sur le concept vinérien de création et de détournement de commerce. Ensuite, la thèse examine le lien entre l'intensité du commerce et la synchronisation du cycle économique et voit l'optimalité possible de l'union monétaire en Asie de l'Est. En outre, l'étude considère également le rôle de la coordination des politiques monétaire et fiscale dans la promotion de la synchronisation des cycles économiques dans la région. Troisièmement, la thèse examine la validité de l'hypothèse d'Orcutt en Asie de l'Est et étudie la réponse des flux commerciaux à la variation du taux de change et des prix relatifs. Ce type d'étude aide les décideurs politiques à choisir entre les politiques commerciales et les politiques de taux de change pour être compétitifs sur le marché mondial. Nous abordons ces objectifs dans trois chapitres différents de la thèse. La contribution et les résultats aident à l'adoption de politiques efficaces et présentent un intérêt académique certain.

Dans le premier chapitre de notre thèse, nous examinons les conséquences ex post des accords commerciaux régionaux (ACR). Nous nous concentrons sur les trois principaux accords commerciaux régionaux et mesurons les effets commerciaux qui découlent de la création de blocs commerciaux. Le commerce international jouant un rôle essentiel dans le développement d'un pays, celui-ci signe des accords commerciaux et élimine les barrières commerciales pour créer des blocs commerciaux et accroître l'impact du commerce sur le bien-être. Comme l'explique David Ricardo dans sa théorie des avantages comparatifs, un pays peut augmenter son revenu et son niveau de consommation en s'engageant dans le commerce. Un pays obtient ce type d'avantages grâce aux économies d'échelle, à l'innovation technologique et à l'amélioration de la consommation qui conduisent à la création d'échanges. À l'inverse, le détournement de commerce désigne une perte de bien-être causée par un transfert de la forme du produit d'un producteur à faible coût vers un producteur à coût plus élevé. Par exemple, si un État non membre possède un avantage comparatif dans un produit particulier, les membres

de l'ACR peuvent manipuler cet avantage comparatif en imposant un tarif. Cette imposition de tarifs encourage et protège le producteur inefficace au détriment du producteur efficace. Cela génère une perte de bien-être et réduit le volume des biens échangés (Viner, 1950).

Il y a deux questions qui ne sont pas abordées dans la plupart des études précédentes. Il s'agit de l'hétérogénéité des paires de pays et le problème des flux commerciaux nuls. Le problème des flux commerciaux nuls peut survenir lorsqu'il n'y a pas de commerce réel entre deux pays. La valeur du commerce nul entre deux économies éloignées et de petite taille pourrait se produire en raison de coûts variables et fixes élevés. La deuxième raison de l'apparition de flux commerciaux nuls peut être le résultat d'erreurs d'arrondi. Par exemple, si les flux commerciaux sont mesurés en milliers de dollars, la valeur commerciale peut être enregistrée comme nulle si elle est inférieure à un certain seuil. En particulier, les valeurs commerciales nulles peuvent se produire fréquemment lorsque nous utilisons des données commerciales désagrégées. Troisièmement, les zéros peuvent être dus à des informations manquantes qui sont enregistrées à tort comme des zéros (Silva et Tenreyro, 2006). En présence de flux commerciaux nuls, les moindres carrés ordinaires (MCO) peuvent donner des résultats biaisés et incohérents. La log-linéarisation conduit à une baisse des flux commerciaux nuls, car leur logarithme ne serait pas identifié. Dans un tel cas, le problème peut être résolu en utilisant l'estimateur de pseudo maximum de vraisemblance de Poisson (PPML) en estimant l'équation sous la forme multiplicative. Deuxièmement, le problème de l'hétérogénéité peut être résolu en introduisant l'effet fixe. En dehors de ces deux problèmes, les études précédentes analysent les effets des ACR sur le commerce en utilisant des données globales sur les flux commerciaux. Elles supposent des effets uniformes de l'élimination ou de la réduction des droits de douane sur les différents flux commerciaux de marchandises. Cependant, la réactivité des différents flux commerciaux de produits de base aux changements de tarifs peut être différente. En conséquence, nous examinons les effets commerciaux des ACR au niveau désagrégé en même temps que les flux commerciaux agrégés. Nous utilisons donc la technique PPML à effet fixe motivée par la théorie pour notre équation de gravité agrégée et par produit afin d'analyser les effets commerciaux des accords commerciaux régionaux. Nous mesurons trois types d'effets commerciaux des ACR dans notre analyse. Nous explorons l'impact de la formation d'un ACR sur le commerce entre deux États membres, et le commerce entre les États membres et non membres. Pour cela, nous utilisons des données de panel de cinquante-cinq pays sur la période 2000-2018 et analysons les effets commerciaux de l'UE, de l'ALENA et de l'ASEAN. En utilisant le PPML à effet fixe, nous trouvons la création de commerce pour tous les ACR

sélectionnés en utilisant leurs flux commerciaux agrégés. Cependant, nous avons besoin de voir en détail ces effets commerciaux car l'élimination des barrières commerciales peut avoir une réponse différente pour divers produits. Pour étudier en détail les impacts commerciaux de ces ACR, nous passons à notre analyse désagrégée. Les analyses au niveau de l'industrie confirment la création de commerce dans 60% des industries de l'UE, tandis que 40% reflètent une diversion commerciale. Les résultats confirment la création de commerce dans 80% des industries de l'ALENA, tandis que la création de commerce se retrouve dans toutes les industries de l'ASEAN. L'accord commercial régional entraîne davantage de création de commerce que de détournement de commerce. Ces résultats indiquent que les pays peuvent augmenter leur gain de bien-être en adhérant à un ACR. En outre, l'étude révèle également un impact significatif des autres variables de gravité sur les flux commerciaux. Le PIB et la population des deux pays déterminent de manière significative leur commerce bilatéral. La distance, qui représente le coût du commerce, possède un signe négatif et affecte significativement les flux commerciaux agrégés et désagrégés.

Le chapitre 2 aborde le deuxième objectif de cette thèse. Il explique les différents critères de la zone monétaire optimale (ZMO) et étudie l'optimalité de la région de l'Asie de l'Est. Le premier objectif du chapitre 2 analyse la théorie de l'endogénéité de la zone monétaire optimale à la Frankel et Rose (1998) et explore le lien entre l'intensité du commerce et la synchronisation du cycle économique. Les pays peuvent réduire leurs coûts de transaction des biens et services échangés en adhérant à une union monétaire. Il serait plus avantageux de former une union monétaire ayant des liens commerciaux étroits. La formation d'une union monétaire peut stimuler les liens commerciaux, et cet avantage peut augmenter le coût de l'adhésion à une union monétaire. En particulier, les liens commerciaux internationaux plus étroits devraient affecter le cycle économique des partenaires commerciaux. Les cycles économiques des pays sont susceptibles d'être considérablement différents de ceux d'avant l'adhésion à une union monétaire. Si le commerce est dominé par le commerce intra-industriel ou si les pays observent un choc de demande commun, on s'attend à ce que la synchronisation des cycles économiques entre les pays augmente (Frankel et Rose, 1998).

Les pays d'Asie de l'Est ont fortement accru leur intégration régionale au cours des dernières décennies, notamment en matière de commerce et d'investissements directs étrangers. Le volume du commerce interrégional en Asie de l'Est représente plus de 50% de leur commerce total. Par conséquent, cette thèse analyse l'endogénéité de la zone monétaire

optimale et explore le lien entre l'intensité du commerce et la synchronisation des cycles économiques en Asie de l'Est. Nous utilisons des données de panel sur la période 2005-2015 pour mesurer l'impact de l'intensité commerciale sur la synchronisation des cycles économiques en Asie de l'Est. Dans un premier temps, nous calculons l'intensité commerciale à l'aide des données commerciales brutes et nous vérifions si l'intensité commerciale du terme brut influence le cycle économique. Nos résultats indiquent que l'intensité commerciale du terme brut ne joue aucun rôle dans la propagation de la synchronisation du cycle économique entre les pays. Ce résultat est dû au fait que les données commerciales brutes peuvent être biaisées en raison de la question du double comptage. Dans une région qui a une part importante dans le commerce à valeur ajoutée, comme l'Asie de l'Est, l'utilisation des données commerciales brutes n'aurait pas de sens et serait mal orientée. En raison de l'importance rapidement croissante de la chaîne d'approvisionnement mondiale, l'Asie de l'Est est apparue comme la deuxième plus grande région ayant contribué au commerce total à valeur ajoutée du monde en 2015. En raison de la chaîne d'approvisionnement mondiale, les produits traversent plusieurs fois les frontières sous la forme de produits intermédiaires. Comme le commerce brut compte les statistiques commerciales à chaque frontière au lieu de la valeur ajoutée nette, les données commerciales conventionnelles exagèrent le contenu domestique des exportations en raison du double comptage. Par conséquent, dans notre deuxième étape, nous utilisons les données commerciales sur la valeur ajoutée pour calculer l'intensité commerciale et la remplacer par la variable d'intensité commerciale du terme brut. Nous trouvons le soutien de l'hypothèse de Frankel et Rose (1998) et obtenons que l'intensité commerciale en termes de valeur ajoutée affecte significativement la synchronisation du cycle économique en Asie de l'Est. La raison pour laquelle le cycle économique se déplace avec le commerce en valeur ajoutée est due au fait que ce sont les exportations en valeur ajoutée qui contribuent au PIB d'un pays plutôt que les exportations brutes. Les autres variables importantes, telles que le commerce intra- industriel, l'intégration financière et la similarité de la structure économique, déterminent également de manière significative la synchronisation du cycle économique en Asie de l'Est.

Un autre objectif du chapitre deux est d'analyser l'impact de la coordination des politiques sur la synchronisation du cycle économique. La coordination des politiques fiscales et monétaires est censée améliorer la synchronisation du cycle économique. Bien que le lien théorique entre la convergence des politiques fiscales et la synchronisation des cycles économiques ne soit pas bien établi, nous pouvons développer plusieurs façons d'entendre un

lien théorique entre la convergence des politiques fiscales et la synchronisation des cycles économiques. Les pays fiscalement irresponsables, c'est-à-dire les pays dont le ratio déficit budgétaire/PIB est élevé, génèrent un choc fiscal asymétrique. Dans ce cas, les pays procèdent à des réformes et réduisent leur ratio de déficit budgétaire par rapport au PIB. Ceci, à son tour, réduit les risques d'effet fiscal asymétrique et augmente la synchronisation de son cycle économique avec celui des autres pays. En d'autres termes, la convergence de la politique budgétaire induit des co-mouvements du cycle économique car les actions budgétaires responsables sont susceptibles d'être moins idiosyncratiques (Nzimande et Ngalawa, 2017). Les études empiriques constatent également que la convergence de la politique budgétaire entraîne une synchronisation du cycle économique (par exemple, Clark et van Wincoop, 2001; Shin et Wang, 2005 ; Crespo-Cuaresma et al. 2011 ; Hauge et Skulevold, 2012 ; Nzimande et Ngalawa, 2017). De même, l'Union européenne souligne également l'importance de la convergence des politiques budgétaires dans le traité de Maastricht signé en 1992. Le traité de Maastricht précise les limites du déficit budgétaire pour les pays avant de rejoindre la zone euro. De même, une politique monétaire commune est suggérée pour la région si elle possède des variations macroéconomiques symétriques. Si les pays partagent des variations macroéconomiques symétriques, il serait bénéfique pour eux d'adhérer à une union monétaire/de devises et de renoncer à leur monnaie souveraine. La coordination de la politique monétaire entre les pays génère la synchronisation du cycle économique dans la région. La politique monétaire est l'une des principales sources du cycle économique, et on s'attend à ce qu'une politique monétaire similaire des pays affecte et réagisse à leurs cycles économiques de manière similaire, c'est-à-dire qu'elle augmente la synchronisation du cycle économique. Par conséquent, nous explorons l'impact de la coordination des politiques fiscales et monétaires sur la synchronisation du cycle économique en Asie de l'Est. Bien que faibles, les résultats révèlent des effets significatifs de la coordination des politiques sur les co-mouvements du cycle économique en Asie de l'Est.

Le troisième chapitre de cette thèse répond au troisième et dernier objectif de notre étude. Dans le chapitre 3, nous analysons l'hypothèse d'Orcutt en Asie de l'Est. L'hypothèse d'Orcutt reflète que les flux commerciaux répondent plus rapidement aux variations du taux de change qu'aux changements des prix relatifs.

Avant la chute du système de Bretton Woods, la recherche se concentrait uniquement sur l'évaluation des élasticités-prix des flux d'exportation et d'importation, généralement connue sous le nom de condition de Marshall-Lerner. La politique commerciale était suggérée si la

somme absolue des élasticités-prix des exportations et des importations était supérieure à un. Cependant, l'effondrement du système de Bretton woods en 1973 a incité les chercheurs à évaluer la réponse des flux commerciaux aux variations du taux de change et des prix relatifs. Les décideurs politiques cherchent à voir l'efficacité des prix relatifs et du taux de change dans la détermination des flux commerciaux internationaux. Le système de taux de change flexible encourage les décideurs à choisir une politique efficace entre les prix relatifs et le taux de change. Par exemple, comment un pays peut accroître sa compétitivité et augmenter ses exportations s'il y a un ralentissement sur le marché international. Dans une telle situation, le pays peut diminuer ses prix en fournissant des subventions ou en dépréciant sa monnaie pour être compétitif sur le marché mondial. Par conséquent, il est nécessaire de connaître la réponse des flux commerciaux au taux de change et aux prix relatifs afin d'élaborer une politique appropriée dans un monde compétitif. Orcutt (1950) a été le premier à observer que les flux commerciaux réagissent plus rapidement à la variation du taux de change qu'à la variation des prix relatifs et que l'inférence politique de cette relation n'est pas uniforme. Si l'hypothèse d'Orcutt se vérifie, un pays doit se concentrer sur la politique de taux de change plutôt que sur une politique commerciale pour gérer un choc de flux commerciaux. Après le postulat d'Orcutt (1950), la littérature conclut également que les flux commerciaux répondent plus rapidement aux variations du taux de change qu'aux variations des prix relatifs. Comme le taux de change et les prix relatifs semblent être des facteurs essentiels des flux d'exportation et d'importation lorsqu'il s'agit de recommander des stratégies, il est proposé que les estimations empiriques soient toujours mises à jour en fonction de l'évolution de la structure économique afin de mieux préconiser les stratégies. Par conséquent, l'analyse empirique des élasticités du revenu, du taux de change et des prix est considérée comme des déterminants essentiels pour choisir entre une politique de taux de change commerciale et une politique de dévaluation. Depuis les années 1980, la part de l'Asie de l'Est dans le commerce mondial a considérablement augmenté, principalement grâce à ses exportations. De 16% en 1980, la part de l'Asie de l'Est dans les exportations mondiales est passée à 30% en 2019. Cette tendance peut être justifiée par un investissement important qui a donné naissance à des secteurs manufacturiers axés sur les exportations, utilisant le bénéfice de faibles coûts de production, principalement en termes de main-d'œuvre. La région qui était dépendante des importations dans les années 1980 est aujourd'hui leader mondial grâce à ses exportations. En outre, les pays d'Asie de l'Est ont considérablement déprécié leur monnaie en 1997 et ont rendu la région plus compétitive. L'étude vise donc à analyser la réponse des flux commerciaux aux changements du taux de

change et des prix relatifs et à choisir une politique efficace entre ces deux variables en Asie de l'Est.

Conformément à la littérature, nous analysons l'hypothèse d'Orcutt en imposant la structure des retards au taux de change nominal et aux prix relatifs. L'acceptation ou le rejet de l'hypothèse d'Orcutt dépend de la structure des retards imposée à chaque variable. L'hypothèse d'Orcutt est acceptée dans ce processus si le taux de change nominal prend moins de retards que les prix relatifs. Nous utilisons des données sur la période de 1990 à 2020. Nous utilisons l'approche de test des limites ARDL pour les équations de demande d'exportation et d'importation afin d'examiner l'hypothèse d'Orcutt, qui présente certains avantages par rapport aux autres techniques. Le principal avantage de l'utilisation de l'approche ARDL est qu'elle peut être appliquée indépendamment de l'existence de $I(0)$ et de $I(1)$. Pesaran et al. (2001) proposent deux nouvelles valeurs critiques pour le test F (c'est-à-dire $I(0)$ et $I(1)$) pour examiner la cointégration entre la variable retardée. Ils proposent la valeur limite supérieure $I(1)$ du test F en supposant que toutes les variables sont intégrées d'ordre un, et une valeur limite inférieure $I(0)$ en considérant que toutes les variables sont intégrées d'ordre zéro. Les variables sont supposées être cointégrées (c'est-à-dire avoir une relation à long terme) si la valeur du test F est supérieure à la valeur de la borne supérieure. Si la valeur du test F est inférieure à la valeur de la borne inférieure, cela indique une absence de relation de long terme entre les variables retardées. Pesaran et al. (2001) expliquent que la cointégration peut toujours exister même si certaines variables sont $I(0)$ et certaines d'entre elles sont $I(1)$. Nous utilisons le critère d'information d'Akaike (AIC) pour sélectionner le modèle optimal et obtenir les résultats à court terme de l'équation ARDL. Nous devons comparer les retards du taux de change et des prix relatifs à l'exportation (à l'importation) pour évaluer l'hypothèse d'Orcutt. Pour valider l'hypothèse d'Orcutt, le taux de change doit avoir un retard inférieur à celui des prix relatifs. Les résultats indiquent que le taux de change effectif nominal a un retard plus court que le prix relatif dans cinq cas sur huit. Cela indique que les flux d'exportation de ces pays répondent plus rapidement aux variations du taux de change qu'aux variations des prix relatifs, c'est-à-dire qu'ils confirment l'hypothèse d'Orcutt. Ces pays sont Hong Kong, la Corée, la Malaisie, la Thaïlande et Singapour. Dans le modèle de demande d'importations, les résultats révèlent que le taux de change effectif nominal prend des retards plus courts et confirme l'hypothèse d'Orcutt dans cinq cas sur huit. Les pays dont les importations réagissent plus rapidement aux variations du taux de change qu'aux variations du prix relatif des importations (c'est-à-dire qu'ils confirment l'hypothèse d'Orcutt) sont Hong Kong, la Corée, la Malaisie, la Thaïlande et la Chine.

Les trois chapitres de cette thèse visent à combler les lacunes de la littérature existante et ont plusieurs implications. Le premier chapitre de notre thèse contribue à la compréhension de la manière dont les accords commerciaux régionaux affectent le commerce des pays membres et non membres. Les résultats indiquent que les accords commerciaux régionaux créent plus de commerce et moins de détournement de commerce. Par conséquent, les pays devraient abolir les barrières commerciales et intégrer les termes de l'échange pour augmenter l'impact du commerce sur le bien-être. À cette fin, les pays devraient réduire non seulement leurs barrières commerciales intra- régionales mais aussi les barrières commerciales avec le reste du monde.

Le chapitre deux analyse l'impact de l'intensité des échanges et de la synchronisation des cycles économiques en Asie de l'Est. En outre, ce chapitre explore également le lien entre la coordination des politiques et la synchronisation des cycles économiques. Sur la base d'un impact positif et significatif de l'intensité des échanges, de la coordination des politiques fiscales et monétaires sur la synchronisation des cycles économiques, nous suggérons plusieurs pistes pour la création d'une union monétaire en Asie de l'Est et dans l'ASEAN. La région n'a peut-être pas encore la dynamique suffisante pour adopter une monnaie régionale commune. Mais la dépendance excessive des pays d'Asie de l'Est vis-à-vis du dollar pourrait ne pas être utile à l'avenir. L'adoption d'une monnaie commune permettra de résoudre l'instabilité financière plus rapidement et efficacement, ce qui sera bénéfique pour l'Asie de l'Est et l'économie mondiale. L'intégration économique en Asie de l'Est s'est développée rapidement ces dernières années, et l'adoption d'une monnaie commune semble plus réalisable qu'il y a 20 ans. La monnaie commune en Asie de l'Est sera utile pour faire face à l'incertitude financière de manière rapide et efficace. Outre l'intégration commerciale, la région d'Asie de l'Est devrait réduire la volatilité de son taux de change et renforcer la coordination des politiques afin de promouvoir la synchronisation des cycles économiques.

Le troisième chapitre explore l'hypothèse d'Orcutt en Asie de l'Est et répond au troisième objectif de notre thèse. Les résultats révèlent que, dans la plupart des cas, les flux commerciaux répondent plus rapidement aux variations du taux de change et des prix relatifs en Asie de l'Est. Sur la base de notre estimation, il est recommandé aux pays dont les flux commerciaux soutiennent l'hypothèse d'Orcutt de se concentrer sur leur politique de taux de change plutôt que sur une politique commerciale pour être compétitifs sur le marché mondial. Cette politique peut également être utile pour ajuster le problème du déficit de la balance commerciale du pays.

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Titre : Effets du commerce, cycles économiques et compétitivité économique

Mots clés : Accords commerciaux régionaux, création de commerce, détournement de commerce, intensité du commerce, synchronisation du cycle économique, hypothèse d'Orcutt

Résumé : L'objectif général de la thèse est d'analyser certains aspects macroéconomiques de l'intégration commerciale. Les divergences empiriques soulevées dans les études précédentes nous amènent aux objectifs clés de notre thèse. Le premier objectif spécifique de la thèse est d'analyser les effets commerciaux des accords commerciaux régionaux (ACR). La création d'ACR entraîne généralement deux types d'effets, à savoir la création de commerce et la diversion de commerce. Dans cette partie, nous nous concentrons sur la création et la diversion des échanges au niveau agrégé et désagrégé. Comme la réponse à l'élimination/réduction des droits de douane peut être différente pour différents produits, nous désagrégeons les flux commerciaux et analysons les effets des ACR sur le commerce pour chaque groupe de produits. Nous utilisons le pseudo-maximum de vraisemblance de Poisson à effet fixe (PPML) pour traiter les problèmes de flux commerciaux nuls et d'endogénéité. Les résultats indiquent que les ACR conduisent à plus de création de commerce et à moins de détournement de commerce. Après l'examen de l'impact des ACR, nous explorons leurs effets macroéconomiques et passons à notre deuxième objectif spécifique. Dans cette partie, nous explorons l'effet de l'intensité

des échanges sur la synchronisation des cycles économiques et nous voyons si le résultat soutient ou non l'hypothèse de Frankel et Rose (1998). Pour atteindre cet objectif, nous soulignons l'importance de la chaîne d'approvisionnement et du commerce à valeur ajoutée dans la période récente. En outre, nous mesurons également l'effet du commerce intra-industriel, de l'intégration financière, de la similarité économique, de la volatilité du taux de change et de la coordination des politiques sur la synchronisation des cycles économiques. Les résultats montrent qu'une plus grande intensité commerciale entraîne une synchronisation du cycle économique. Les autres variables jouent également un rôle important dans la synchronisation du cycle économique. Le troisième objectif porte sur la manière dont un pays peut être compétitif à l'ère de l'intégration régionale. Pour ce faire, nous testons l'hypothèse d'Orcutt et analysons la réponse des flux commerciaux aux changements du taux de change et des prix relatifs. Les résultats révèlent que l'hypothèse d'Orcutt est soutenue dans la plupart des cas, et que les flux commerciaux répondent plus rapidement aux variations du taux de change qu'aux variations des prix relatifs.

Title: Trade effects, business cycles, and economic competitiveness

Keywords: Regional trade agreements, Trade creation, trade diversion, Trade intensity, business cycle synchronization, Orcutt hypothesis

Abstract: The general objective of the thesis is to analyze certain macroeconomic aspects of trade integration. The empirical discrepancies raised in the earlier research studies move us to the key objectives of our thesis. The first specific aim of the thesis is to analyze the trade effects of regional trade agreements (RTAs). The creation of RTAs usually leads to two types of effects, i.e., trade creation and diversion. In this part, we focus on trade creation and trade diversion at the aggregate and disaggregate levels. As the tariff elimination/reduction response can differ for different products, we disaggregate the trade flows and analyze the trade effects of RTAs for each product group. We use the fixed-effect Poisson pseudo-maximum likelihood (PPML) to deal with zero-trade flows and endogeneity problems. The results indicate that RTAs lead to more trade creation and less trade diversion. After the examination of RTAs' impact, we explore their macroeconomic effects and move to our second specific objective. In this part, we explore the effect of trade intensity on business cycle synchronization and see whether the result supports the

Frankel and Rose (1998) hypothesis or not. To address this objective, we highlight the importance of the supply chain and the value-added trade in the recent era. Apart from this, we also measure the effect of intra-industry trade, financial integration, economic similarity, exchange rate volatility, and policy coordination on business cycle synchronization. The results show that higher trade intensity leads to synchronization of the business cycle. The other variables also play an important role in the synchronization of the business cycle. The third objective addresses how a country can be competitive in the era of regional and global integration. For this purpose, we test the Orcutt hypothesis and analyze the response of the trade flows to the changes in the exchange rate and changes in relative price. The results reveal that the Orcutt hypothesis is supported in most cases, and trade flows respond faster to changes in exchange rate than to changes in relative prices.