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The impact of RCEP on labour markets in non-member economies: evidence from Taiwan, China

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Taiwan, China's labour market faces numerous challenges. However, previous studies have given limited attention to the impact of regional trade agreements on Taiwan's labour force. This study examines the impact of the Regional Comprehensive Economic Partnership (RCEP) on Taiwan's labour market by assessing its effects on economic growth, labour demand, and wages. Utilising the Global Trade Analysis Project (GTAP) 10.0 database, this study applies the GTAP model to assess the effects of the RCEP on Taiwan's labour force. The analysis uses data from 2014 that is dynamically projected to 2023. The findings suggest that the RCEP has a negative impact on both labour demand and wages in Taiwan. However, the effects vary across industries and skill levels. In sectors with sensitive regulations, labour employment is positively affected by 'reverse trade diversion.' Unskilled labour is more adversely impacted by the RCEP than skilled labour. Furthermore, the RCEP negatively influences Taiwan's economic growth, including GDP, social welfare, and trade (both imports and exports). Taiwan's accession to RCEP could reverse these negative impacts. These findings offer valuable insights into the effects of trade liberalisation on the labour market, highlight the importance of regional economic cooperation, and provide essential information for Taiwan's economic adaptation strategies in the context of regional economic integration.

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Introduction

The United Nations Sustainable Development Goal (SDG) No. 8 explicitly calls for the promotion of ‘sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work for all.’ In this context, in-depth research on the labour force becomes especially important. Previous studies have examined the negative impacts of various factors, such as industrial robots (Acemoglu and Restrepo, 2020), artificial intelligence (Zhou et al. 2020), inequality (Hutter and Weber, 2023), and the potential removal of import tariffs (Pierce and Schott, 2016) on labour employment and wage growth. Conversely, research has shown that the enhancement of global value chain status (Mingyang et al. 2023) and participation in the Regional Comprehensive Economic Partnership (RCEP) (Park et al., 2021a) have had a positive effect on labour employment and wage levels.

It is worth noting that while the study by Cyn-Young Park et al., (2021a) provides an in-depth examination of the impact of the RCEP on the labour force in member economies, there is a relative paucity of research on its effects on the labour force in non-member economies. Taiwan is a non-member economy. A significant portion of Taiwan’s labour force faces employment instability and working poverty (Li, 2022). Additionally, labour shortages resulting from an aging workforce pose a serious challenge to the sustainable growth of Taiwan’s economy (Goh et al., 2023). This study focuses on the Taiwanese labour market, which occupies a unique economic and political position compared to other non-member economies. Taiwan was selected for this study for three main reasons. First, Taiwan is a typical small and open economy, highly dependent on international trade, making it particularly sensitive to changes in global trade policies. Second, Taiwan has close trade relations with RCEP member economies. According to the Department of International Trade, Ministry of Economic Affairs, in 2023, RCEP economies will account for 49.99% of Taiwan’s total exports and 59.45% of its total imports. Third, Taiwan occupies a unique geopolitical position and faces numerous challenges in its labour market. These three factors suggest that Taiwan’s labour market may be more affected by RCEP than other non-member economies. Therefore, this study aims to answer the following questions: What is the impact of RCEP on Taiwan’s labour market, and what adaptation strategies can Taiwan adopt?

This study makes two key contributions to the literature on RCEP and the labour market. First, it assesses the impact of reductions in RCEP tariff rates and non-tariff barriers on Taiwan’s labour market using the Global Trade Analysis Project (GTAP) model. By quantitatively measuring the impact of RCEP on Taiwan’s GDP, welfare, trade, labour demand and wages, this study helps to fill the gap in research on non-member economies. Given that RCEP has been formally implemented for only a short period, most existing studies focus on policy evaluation or ex ante forecasting through quantitative models. Among these, the computable general equilibrium (CGE) model is a key tool for assessing policy effects. While previous studies have used CGE models to evaluate the potential impact of RCEP on economic growth (Petri and Plummer, 2020), trade and income (Li and Moon, 2018), social welfare (Li et al., 2016a), and specific industries such as the electronic information industry (Liu et al., 2025), there remains a lack of research examining its effects on non-member economies.

Second, this study enhances our understanding of the impact of RCEP on the labour market through the lens of trade creation and trade diversion. While previous studies have examined the effects of trade agreements on the labour market (Kovak and Morrow, 2024), they have primarily focused on changes in the structure of the economy (e.g. foreign direct investment (Kim,

2021) and import penetration (Hayakawa et al., 2021)), as well as in employment structure (Chan, 2019), labour share (González-Rozada and Ruffo, 2024), employment gaps (Hoang and Nguyen, 2020), and wages (Hakobyan and McLaren, 2016). In contrast, trade creation and trade diversion are more commonly used to explain the impact of trade agreements on trade itself (Tian et al., 2022) and to assess the overall economic effects of such agreements (Estrades et al., 2023). However, few studies have explored the trade-labour market interactions induced by trade agreements through the perspectives of trade creation and trade diversion. International trade, indeed, has a significant impact on the labour market (Caliendo et al., 2019). This study applies the analytical framework of trade creation and trade diversion to examine the labour market, arguing that while RCEP may have a negative impact on Taiwan’s labour market, the effects are likely to vary across industries.

The remainder of this paper is structured as follows: First, we review previous research on the impact of regional trade agreements on economic growth and the labour market, and analyse how RCEP influences economic growth, labour demand, and wages. We then introduce the GTAP model and its associated database, providing a detailed explanation of the data processing methods and the rationale behind the simulation scenario setup. Next, we present and discuss the simulation results for GDP, welfare, imports and exports, labour demand, and wages. In the final section, we summarise the main findings, offer policy implications, and highlight the study’s limitations. This research aims to contribute to the existing literature and provide valuable insights for policymakers and stakeholders regarding the potential impact of RCEP on the labour markets of non-member economies.

Literature review and hypothesis development

Impact of RCEP on economic growth. RCEP is a prime example of a mega-regional trade agreement (Palit, 2017), and its establishment represents a major step forward in regional economic integration within the Asia-Pacific (Chen et al., 2023). The idea of regional economic integration is rooted in Jacob Viner’s theory of customs unions (Viner, 1950). In this theory, Viner introduced the concepts of ‘trade creation’ and ‘trade diversion’, which have become essential in understanding the effects of regional trade agreements (Muradov, 2021).

Trade creation refers to the shift of production from a high-cost home country to a low-cost partner country resulting from the removal of intraregional trade barriers (Kreinin, 1959). RTAs promote intraregional trade by lowering trade costs between member economies, primarily through reductions in tariffs and non-tariff barriers (Hayakawa et al., 2016). For example, RCEP increases trade volume, income, and social welfare for mainland China and South Korea (Zhao and Mun, 2023). Additionally, RCEP has significantly expanded market size, creating more opportunities for member economies (Tran and Tran, 2023). For instance, trade in textiles and apparel among RCEP members has surged, particularly in textile exports from mainland China to other member countries (Yang and Kumarasinghe, 2024). This growth has been crucial in stimulating production expansion by regional firms (Wong et al., 2017) and increasing demand for innovation (Yang and Kumarasinghe, 2024). While RTAs have brought substantial benefits to member economies, they can negatively impact non-member countries. The tariff preferences granted within RTAs can reduce imports from non-members (Limão, 2016), especially when combined with rules of origin (Conconi et al., 2018). For example, the US-Canada Free Trade Agreement has facilitated trade between the US and Canada, but

has led to trade diversion from non-member economies (Gaston and Trefler, 1997). This shift in trade patterns can adversely affect the economic growth of non-member countries.

Trade diversion occurs when the removal of intra-regional trade barriers leads to a shift in product imports from low-cost non-partner countries to higher-cost partner countries (Kreinin, 1959). For example, the RCEP reduces trade costs among member countries by lowering both tariff rates and non-tariff barriers (Khan et al., 2022), while also improving trade facilitation (Wei, 2024). The agreement's rules of origin encourage firms to increase their use of raw materials and intermediate goods sourced from within the region (Ling and Qian, 2023). As a result, some economies have shifted their imports to more efficient RCEP member countries, thereby reducing their reliance on non-member nations (Suvannaphakdy, 2021). Furthermore, the implementation of the RCEP has negatively impacted the economic growth of non-member economies. For instance, The RCEP is expected to have negative impacts on Chinese Taiwan, and India (Park et al., 2021b). However, the spillover effects of such deep trade agreements may still benefit certain sectors in non-member economies. RTAs tend to make member countries' markets more open by reducing trade barriers between them, which is attractive to exporters from non-member countries (Baldwin, 2014). Additionally, RTAs can increase trade between members and non-members, particularly in industries that are sensitive to regulatory changes (Lee et al., 2023).

Impact of RCEP on labour force employment and wages. The impact of RTAs on employment and wages is complex. For example, the North American Free Trade Agreement has slowed the annual growth of unemployment in the US (Francis and Zheng, 2011) and had a positive effect on overall employment in Mexico (Trachtenberg, 2019). Similarly, the RCEP fosters trade and investment among member countries through measures such as tariff reductions and exemptions (Wicaksono and Yuanfen, 2023), which, in turn, help generate new jobs in these economies (Fernandez and Portes, 1998). However, the effects have not been consistent across all sectors. For instance, North American Free Trade Agreement (NAFTA) has contributed to slower wage growth for workers in certain industries and regions, particularly those facing increased competition from imports (Hakobyan and McLaren, 2016).

RTAs promote free trade by reducing trade barriers between member economies (Ejones et al., 2021). Changes in these barriers can shift comparative advantages (Baldone et al., 2007), leading to a reallocation of trade flows and a shift in investment toward member economies of the agreement (Palit, 2017). As a result, RTAs negatively affect economic growth (Ciuriak and Singh, 2015) and relative wages (Mossay and Tabuchi, 2015) in non-member economies. Furthermore, the discriminatory nature of regional trade policies intensifies market competition (Viaene and Moraga-González, 2013). Increased competition pressures employers in non-member economies to raise wages or improve working conditions to attract and retain employees, which could have a positive impact on labour markets in these economies (Lloyd and McLaren, 2004). However, certain industries in non-member economies might face reduced employment opportunities and skill mismatches, as they struggle to adapt to this heightened competition (MacPhee and Sattayanuwat, 2014).

Hypothesis. This study hypothesises that the RCEP negatively impacts the economic growth of Taiwan. The RCEP has led to a shift in trade and investment from Taiwan to other economies within the RCEP region, which may harm Taiwan's economic growth. Additionally, trade liberalisation does not directly influence labour supply. Therefore, this study suggests that RCEP

reduces labour demand and wages in Taiwan. However, the effects of RCEP vary across different industries and labour groups, as it can lead to 'reverse trade diversion'—the creation of new foreign trade, particularly in industries that are sensitive to regulatory changes.

Research method

The GTAP model. CGE model is an economic modelling approach based on general equilibrium theory. It describes the supply, demand, and market relationships within an economy through a system of equations, solving for equilibrium outcomes using numerical calculations. This method simulates the new equilibrium state that the market reaches under the influence of factors such as policy shocks. For instance, previous studies have employed CGE models to assess the macroeconomic impact of the Russia-Ukraine conflict on Ukraine (van Meijl et al., 2024).

Due to the relatively short duration since the implementation of the RCEP, most studies have used the CGE model to conduct ex ante forecasts. The GTAP model is a CGE model grounded in neoclassical economic theory, designed to analyse multiple countries and sectors. Developed by the Global Trade Analysis Programme at Purdue University, the GTAP model consists primarily of two components: the main programme (RunGTAP) and the database (GTAPAgg). The model allows researchers to introduce policy shocks—such as tariff adjustments, the implementation of regional trade agreements, and carbon tax policies—via the main programme and perform simulation analyses. The GTAP model's database provides essential economic and trade data for various countries or regions, supporting both the main programme and policy simulations. The GTAP model is widely used to evaluate the impact of different trade policies on the economy. It assumes a perfectly competitive market, where households, governments, and producers are the primary agents. Each entity can choose to purchase either domestic or foreign goods and determines its consumption mix through the use of CDE, Cobb-Douglas, and CES functions. The mathematical model and internal structure of the GTAP model can be found in the Supplementary Appendix.

The GTAP model is a bottom-up CGE model that includes a global economic database, covering many regions and sectors worldwide (Ghaith et al., 2021). The model's effectiveness in predicting the labour force impact of exogenous shocks, such as China's growth and trade (Mirza et al., 2014), return migration (Ghani and Morgandi, 2023), and the US-Japan trade agreement (Yi, 2024), has been validated, making it a reliable tool for analysing the impact of RCEP on Taiwan's labour market. Compared to prediction methods like AutoML (Li et al., 2022), deep neural networks (Lei et al., 2023), and GMDH neural networks (Li et al., 2016b), the GTAP model is better equipped to capture the complex effects of large-scale regional trade policies such as RCEP. It can simulate interactions between different countries and industries, providing more comprehensive and detailed insights.

GTAP analogue area settings. RCEP members include Mainland China, Japan, South Korea, Australia, New Zealand, and the ASEAN countries (Singapore, Malaysia, Indonesia, Thailand, Vietnam, Laos, Myanmar, Cambodia, Brunei, and the Philippines). By singling out these economies, this study clarifies the broader implications of RCEP. The Hong Kong SAR government has formally submitted its application to join RCEP, and listing Hong Kong separately in this study allows for a focused analysis of the potential impact of RCEP's expansion. The United States and the European Union are significant trading partners for both Taiwan and RCEP member economies. Listing them separately

Table 1 Division of regional groups.

Code	Corresponding economies/regions in the GTAP10 database
CHN	Mainland China (excluding Hong Kong, Macao and Taiwan)
TAP	Taiwan, China
HKG	Hong Kong, China
JPN	Japan
KOR	Korea
AUS	Australia
NZL	New Zealand
ASEAN	Singapore, Malaysia, Vietnam, Indonesia, Philippines, Thailand, Laos, Cambodia, Brunei
USA	United States
EU-27	The United Kingdom left the European Union and is now the EU27
RestofWorld	GTAPAgg2 countries and regions other than those listed above

In the GTAP database, Myanmar was initially classified as other Southeast Asian regions. Considering that Myanmar's economic size is relatively small and has little impact on the overall data, ASEAN does not include Myanmar in the regional setting of this article.

Table 2 Industry setting.

Code	Corresponding sectors in the GTAP 10 database
Agr	Rice; wheat; other cereals; vegetables; fruits and nuts; oil crops; sugar crops; other crops; animals such as cattle and sheep; other animals; raw milk; wool and mulberry silk; fisheries; forestry
Food	Vegetables; oils; dairy products; sugar; beverages and tobacco; beef products; other meat products; other agricultural products
Mine	Mining coal; oil; gas; other mineral products
Tex	Textiles; synthetic fibres; clothing and apparel
Lig	Fur; leather; bags; handbags; shoes; wood; wooden products; straw woven material products; paper products; printing
Petr	Coking products; petroleum; finished oil; basic chemicals; other chemicals; rubber and plastic products; cement; glass; concrete
Meta	Basic production and forging; sheet metal products; non mechanical and equipment; production and forging of copper; aluminium; zinc; lead
Ele	Calculator; radio; precision optical instruments; medical; television; and communication equipment
Mech	Electrical machinery and equipment; clocks; other transportation equipment outside of motor vehicles
Oma	Other manufacturing industries
Psc	Electricity; natural gas production and transportation; water supply; construction
Serv	Trade; residential and food services; other transportation; water transportation; air transportation; warehousing; communication; other finance; insurance; real estate; other commercial services; entertainment and other services; public administration; education; health and social services; residential services

enables a more nuanced discussion of Taiwan's future trade direction. The 'Rest of the World' category encompasses all countries and regions not mentioned above, providing a more comprehensive measure of RCEP's global impact.

Therefore, this study classifies the 141 countries or regions in the GTAP 10.0 database into 11 groups: Mainland China, Taiwan of China, Hong Kong of China, Japan, South Korea, Australia, New Zealand, ASEAN, the United States, the European Union, and the Rest of the World. The specific groupings are detailed in Table 1.

This article categorises the 65 industries in the GTAP 10.0 database into 12 groups based on research requirements and a comparison with HS2 codes, as shown in Table 2.

Scenario. This study is based on the GTAP 10.0 database, which is developed and maintained by Purdue University in the United States. The database uses 2014 as the base year and includes data for 141 countries or regions and 65 industrial sectors. The GTAP 10.0 database provides detailed data on various aspects, including trade, production, consumption, factor inputs, tariffs, and non-tariff barriers (NTBs), for all the countries and regions involved in this study. It is one of the key datasets for assessing the impacts of global policy changes. The ability of the GTAP database to predict the effects of exogenous shocks has been extensively validated in numerous studies. For example, previous studies have modelled the impact of climate change (Qiao et al., 2023), international trade sanctions (Huang et al., 2024), regional carbon emission

reductions (Liu et al., 2022), trade restrictions (Lin et al., 2019), US-China trade frictions (Ma et al., 2024), and free trade zones (Yin et al., 2024), among others. The core structure and key indicators of the GTAP 10.0 database can be found in the Supplementary Appendix.

The benchmark year for this version is 2014. This study draws on previous research by Ahmed et al., (2020), Ma et al., (2024), and Yue et al., (2024) and adopts the French Centre for International Economic Studies' Econmap database, which is officially recommended for use in GTAP modelling (Fontagné et al., 2022). The GDP, population, capital, skilled labour, and unskilled labour data from 2014 to 2023 are updated using the Econmap database. However, the Econmap database does not provide forecast data for Taiwan. To estimate Taiwan's data in the GTAP database, the study calculates the average annual growth rate of data published by the Executive Yuan of Taiwan for the years 2014–2022. This growth rate is then applied to extrapolate the relevant data for Taiwan. Using the tariff commitment tables of each RCEP member country, the study calculates a weighted average tariff level, with the value of international trade among RCEP members (classified by HS6 codes) serving as the weights. The calculated tariff levels for each member country at each stage of RCEP implementation are then compared with the base period rates to determine the tariff reductions. Finally, simulations are conducted based on the predefined scenario settings.

This study draws on indicators of the SDGs. However, due to data availability constraints, the study focuses on labour demand,

Table 3 Simulation results of changes in GDP of economies under different scenarios.

	S1	S2	S3
CHN	4.41%	4.68%	5.25%
TAP	−16.15%	−16.73%	18.36%
HKG	−3.80%	39.83%	34.75%
JPN	16.48%	16.46%	10.30%
KOR	25.03%	25.20%	18.96%
AUS	14.46%	14.71%	7.31%
NZL	16.96%	17.1%	11.53%
ASEAN	15.11%	15.57%	14.98%
USA	−2.34%	−2.51%	−0.13%
EU-27	−2.66%	−2.95%	−0.54%
RestofWorld	−2.69%	−2.87%	−0.56%
World	1.96%	2.15%	2.41%

Table 4 Simulation results of changes in social welfare in economies under different scenarios.

	S1	S2	S3
Unit	Million-USD	Million-USD	Million-USD
CHN	655984.94	707504.38	693502.31
TAP	−43392.67	−45038.74	100055.16
HKG	−5237.10	110955.80	103300.07
JPN	434656.97	441374.69	409361.75
KOR	262444.94	267575.56	239152.89
AUS	131888.50	135190.56	126606.15
NZL	26312.88	26748.51	24739.74
ASEAN	434569.56	451435.16	424960.03
USA	−37884.66	−44860.04	−47063.41
EU-27	−77341.52	−96185.59	−96017.36
RestofWorld	−165928.47	−180805.59	−174892.75
World	1616073.37	1773894.7	1803704.58

wages, gross domestic product, social welfare, and trade (imports and exports) as key indicators to analyse the impact of RCEP. The study sets up three scenarios, considering potential paths for RCEP tariff commitments and NTB reductions, as well as Hong Kong's application to join RCEP. These scenarios aim to capture the different impacts of RCEP on Taiwan's labour market and economy, providing more comprehensive policy insights.

Scenario 1 (S1): The study simulates the impact of RCEP trade liberalisation and analyses the external pressures on Taiwan's labour market. The scenario assumes that tariff reductions among RCEP members will reach the levels projected for 20 years from now, with a 20% reduction in NTBs for goods and a 70% reduction in NTBs for services.

Scenario 2 (S2): Builds on Scenario 1, incorporating Hong Kong's accession to RCEP. This scenario includes a 90% reduction in tariffs, a 20% reduction in NTBs for goods, and a 70% reduction in NTBs for services between Hong Kong and the current RCEP member economies.

Scenario 3 (S3): Builds on Scenario 1, with the inclusion of both Hong Kong and Taiwan's accession to RCEP. This scenario assumes a 90% reduction in tariffs, a 20% reduction in NTBs for goods, and a 70% reduction in NTBs for services between Hong Kong, Taiwan, and the current RCEP member economies.

Results

The impact of RCEP on Taiwan's economic growth

Impact of RCEP on GDP. GDP is a key indicator for assessing the impact of RTAs. As shown in the simulation results in Table 3, Taiwan's GDP is negatively impacted in Scenario 1, declining by 16.15% relative to the baseline. In Scenario 2, Taiwan's GDP experiences an even greater negative impact when Hong Kong joins RCEP. The decline in Taiwan's GDP relative to the baseline widens to 16.73%. This suggests that the expansion of regional economic integration exacerbates the negative impact on non-member economies. In Scenario 3, when Taiwan joins RCEP, its GDP increases by 18.36% compared to the baseline.

RCEP contributes to global GDP growth, and this growth becomes even more pronounced as membership expands. RCEP member economies experience varying degrees of GDP growth, with South Korea benefiting the most. In contrast, non-member economies generally experience a decline in GDP, with Taiwan being the most severely affected. This is due to Taiwan's strong trade ties with RCEP members and its status as a small, open economy. However, when both Hong Kong and Taiwan joined RCEP, they experienced significant GDP growth. This suggests that smaller economies are more likely to benefit from trade liberalisation.

Impact of RCEP on social welfare. Social welfare is a key consideration for economies when making policy decisions. The GTAP model measures the welfare of a population using the ratio of the Hicks Equivalent Variation to the total income of the region, thus accounting for the combined effect of both per capita total utility and total income. As shown in Table 4, Taiwan experiences a significant welfare loss in S1, amounting to 43,392.67 million USD. In S2, the accession of Hong Kong to RCEP leads to an even greater loss in Taiwan's social welfare, which rises to 45,038.74 million USD. This suggests that an increase in RCEP membership results in a more severe welfare loss for Taiwan. In S3, Taiwan's membership in RCEP improves its welfare compared to the baseline, with an increase of 10,055.16 million USD.

In S1, the implementation of RCEP leads to an overall increase in global welfare of 1,616,073.37 million USD. In S2 and S3, as membership expands, global welfare rises by 1,773,894.70 million USD and 1,803,704.58 million USD, respectively.

In all three scenarios, the social welfare of RCEP member economies improves relative to the baseline. Additionally, in S2, the reduction of RCEP tariffs and NTBs contributes to an increase in Hong Kong's welfare. Hong Kong's accession further boosts the social welfare of RCEP member economies. In S3, when both Taiwan and Hong Kong join RCEP, the welfare of RCEP members increases, but the growth is smaller compared to S2. This is primarily because Hong Kong, as an economy highly dependent on trade and finance, is better positioned to stimulate intra-regional investment and trade after joining RCEP, thereby enhancing the welfare of member economies. While Taiwan's accession could deepen economic cooperation, it may also introduce effects such as increased competition and trade diversion, leading to a smaller welfare gain for RCEP members.

Impact of RCEP on exports and imports. As shown in Table 5, in S1, Taiwan's imports decreased by 17.46%, and exports declined by 15.95%. This indicates that the reduction of RCEP tariffs and NTBs has made Taiwan less competitive in the RCEP market, leading to a decrease in both imports and exports. This can be attributed to the trade diversion effect. The reduction in trade costs within RCEP, combined with the fact that Taiwan faces higher tariffs and NTBs compared to RCEP member economies, disrupts Taiwan's trade with these members.

In S2, Taiwan's imports decreased further, by 17.92%, and exports dropped by 16.41%. After Hong Kong's accession to RCEP, trade barriers with RCEP members were further reduced, and the trade diversion effect likely intensified. Additionally,

Table 5 Simulation results of changes in exports and imports of economies under different scenarios.

	Import			Export		
	S1	S2	S3	S1	S2	S3
CHN	19.24%	20.62%	22.64%	13.45%	14.40%	15.73%
TAP	-17.46%	-17.92%	34.33%	-15.95%	-16.41%	31.22%
HKG	-4.99%	39.23%	39.81%	-5.10%	38.12%	38.66%
JPN	28.65%	29.16%	29.62%	24.32%	24.94%	25.32%
KOR	38.15%	38.84%	37.58%	34.59%	35.21%	34.03%
AUS	28.25%	28.91%	29.60%	25.83%	26.47%	27.09%
NZL	30.25%	30.73%	31.23%	27.41%	27.83%	28.09%
ASEAN	20.06%	20.90%	21.21%	18.91%	19.70%	19.96%
USA	-3.45%	-3.67%	-4.18%	-5.41%	-5.92%	-6.75%
EU-27	-3.22%	-3.43%	-3.89%	-3.38%	-3.63%	-4.11%
RestofWorld	-3.60%	-3.82%	-4.26%	-3.71%	-3.95%	-4.40%

Table 6 Simulation results of labour demand changes in various industries in Taiwan.

	Skilled labour			Unskilled labour		
	S1	S2	S3	S1	S2	S3
Aggregate	-9.59%	-9.85%	21.25%	-9.25%	-9.54%	20.79%
Agr	7.76%	8.07%	-5.61%	7.85%	8.15%	-5.73%
Food	7.37%	7.62%	-4.34%	7.74%	7.97%	-4.86%
Mine	12.12%	12.76%	-14.62%	12.19%	12.83%	-14.72%
Tex	-0.04%	0.91%	-14.83%	0.38%	1.30%	-15.41%
Lig	10.50%	10.97%	-4.11%	10.92%	11.37%	-4.69%
Petr	-1.05%	-0.89%	12.09%	-0.63%	-0.50%	11.51%
Meta	12.28%	12.63%	-10.71%	12.70%	13.03%	-11.29%
Ele	-22.55%	-22.90%	0.32%	-22.13%	-22.51%	-0.26%
Mech	17.97%	18.62%	-6.24%	18.39%	19.02%	-6.82%
Oma	17.15%	17.43%	-13.60%	17.57%	17.83%	-14.18%
Psc	-5.62%	-5.74%	11.25%	-5.17%	-5.31%	10.63%
Serv	0.44%	0.42%	-0.34%	0.90%	0.85%	-0.97%

Hong Kong's unique geographical location and financial position play a significant role in this process.

In S3, Taiwan's accession to RCEP led to a significant increase of 34.33% in imports and 31.22% in exports. This is primarily due to Taiwan receiving preferential trade treatment after joining RCEP, which helped to reverse the negative impact of trade diversion.

In all three scenarios, RCEP promotes the growth of import and export trade volumes in member economies, but it also leads to trade losses for non-RCEP economies. This suggests that while RCEP enhances trade for its member economies, it harms non-member economies. However, in S3, Taiwan's accession may create competitive pressure on South Korea, causing a relative slowdown in the growth of South Korea's imports and exports. This indicates that the impact of new members joining an RTA can vary among existing members. Economies with similar industrial structures may experience increased competition.

The impact of RCEP on labour demand and wages in Taiwan

Impact of RCEP on labour demand. The reduction of tariffs and non-tariff measures within RCEP has a negative impact on Taiwan's labour demand. In S1 and S2, Taiwan's aggregate labour demand declines to varying degrees. However, after Taiwan's accession to RCEP, aggregate labour demand shows an upward trend. Additionally, RCEP does not affect labour demand equally across different industries. The simulation results are shown in Table 6.

In S1, Taiwan's total labour demand declined, with skilled labour demand falling by 9.59% and unskilled labour demand

dropping by 9.25%. The magnitude of these changes in labour demand varies across industries. Labour demand decreases in sectors such as electronic information, textiles, petrochemicals, public services, and construction. This is primarily due to lower production costs in the RCEP region.

Taiwan's electronics and information manufacturers, attracted by the lower production costs within the RCEP, have reorganised their supply chains and shifted production to the RCEP region. As a result, there has been a decline in demand for local Taiwanese labour. Additionally, RCEP has made textile exports from ASEAN countries more price-competitive, which has increased competition for Taiwan's textile exports and diminished its cost advantage. This, coupled with shrinking export markets and the relocation of textile companies, has led to a reduction in local labour demand Table 7.

Taiwan's local petrochemical industry, which relies on imports for its scarce raw materials, has seen a decline in its role within the East Asian petrochemical supply chain due to RCEP. Furthermore, reduced trade and investment have lowered demand for labour in Taiwan's public services and construction sectors, making it difficult to generate local jobs in these industries.

Conversely, labour demand in Taiwan's agriculture, certain traditional manufacturing, and service sectors has increased to varying degrees. This can be attributed to the positive spillover effects of 'deep' trade agreements on the export of regulation-intensive products from non-member economies.

In S2, Hong Kong's accession to RCEP further exacerbated the negative impact on Taiwan's labour demand. Taiwan's demand

Table 7 Simulation results of labour wage changes in economies under different scenarios.

	Skilled labour			Unskilled labour		
	S1	S2	S3	S1	S2	S3
CHN	4.16%	4.26%	4.41%	4.06%	4.29%	4.43%
TAP	−14.36%	−14.91%	25.64%	−14.70%	−15.22%	25.18%
HKG	−3.59%	33.29%	34.58%	−3.52%	33.97%	33.88%
JPN	15.23%	15.15%	15.16%	15.13%	15.11%	15.23%
KOR	22.73%	22.80%	22.46%	23.15%	23.26%	22.02%
AUS	13.36%	13.55%	13.88%	13.40%	13.60%	13.83%
NZL	15.28%	15.38%	15.22%	14.89%	15.01%	15.60%
ASEAN	14.93%	15.28%	14.55%	14.03%	14.41%	15.43%
USA	−2.33%	−2.50%	−2.84%	−2.33%	−2.50%	−2.83%
EU-27	−2.59%	−2.86%	−3.26%	−2.63%	−2.90%	−3.22%
RestofWorld	−2.62%	−2.86%	−3.15%	−2.59%	−2.82%	−3.18%

for skilled labour fell by 9.85%, and unskilled labour demand declined by 9.54%. In particular, labour demand in Taiwan's dominant industries, such as electronics and information, and in the service sector, decreased even further. However, labour demand in traditional industries, such as agriculture, food processing, light industry, and machinery and equipment, increased compared to S1.

In S3, Taiwan's labour demand rose significantly, with skilled labour increasing by 21.25% and unskilled labour demand growing by 20.79%. This indicates that Taiwan's labour force as a whole benefited from RCEP's trade liberalisation. However, labour demand in Taiwan's agriculture, food processing, extractive industries, textiles, and light industries declined, mainly because imported goods became cheaper following Taiwan's accession to RCEP. This greater price competition reduced demand for Taiwan's locally produced goods, leading to lower hiring and a decline in labour demand. Conversely, Taiwan's petrochemical and electronics industries, where it holds a competitive advantage within RCEP, benefited from trade liberalisation, leading to an increase in labour demand. The public services and construction sectors also benefited from infrastructure investments brought about by economic growth, which boosted labour demand in these industries. The service sector showed little change, suggesting that RCEP had a relatively small impact on this sector.

As shown in Table 6, the more substantial reductions in tariffs and NTBs under RCEP have had a more negative impact on Taiwan's total labour demand. Labour demand in Taiwan's key industries, which employ a large portion of the workforce, has decreased. While Taiwan's agriculture and food processing industries have seen growth in labour demand due to negative trade shifts, this growth cannot compensate for the overall contraction in labour demand. Taiwan's accession to RCEP could help reverse the negative impact.

The impact of RCEP on labour wages. Reductions in tariffs and NTBs within RCEP can stimulate wage growth in member economies while suppressing wages in Taiwan. However, Taiwan's accession to RCEP has the potential to reverse this negative impact. The simulation results are as follows:

In both S1 and S2, the wage levels of skilled and unskilled labour in non-member economies declined to varying degrees. In S1, the wages of skilled labour in Taiwan decreased by 14.36%, while unskilled labour wages dropped by 14.70%. This decline is mainly due to the reduced competitiveness of Taiwan's goods in the international market, leading to lower corporate profits and, consequently, a decrease in wages. The overall downward trend in both skilled and unskilled labour wages indicates that Taiwan's

labour market has been negatively affected by the changes in RCEP trade barriers. A similar trend is observed in labour wages in Hong Kong, the US, and the EU.

In S2, Taiwan experienced a further decline in wages: skilled labour wages fell by 14.91%, and unskilled labour wages dropped by 15.22%. After Hong Kong's accession to RCEP, a trade diversion effect between Hong Kong and Taiwan may have occurred. As trade barriers were further restricted, this led to a further decline in wages in Taiwan. Additionally, the decline in skilled labour wages was smaller than that of unskilled labour, as skilled labour tends to be more resistant to external shocks compared to unskilled labour.

In S3, Taiwan's labour wages increased significantly, with skilled labour wages rising by 25.64% and unskilled labour wages increasing by 25.18%. After Taiwan's accession to RCEP, international market demand improved, which helped push up wages. The larger increase in skilled labour wages may be due to the increased demand for high-skilled workers in high-end manufacturing sectors, such as electronics and information technology.

In RCEP member economies, both skilled and unskilled labour wages rose to varying degrees. In S1, South Korea experienced the largest increase in wages. Skilled labour wages in South Korea rose by 22.73%, while unskilled labour wages increased by 23.15%. In S2 and S3, Hong Kong saw the largest wage increases, with skilled labour wages rising by 33.29% in S2 and 34.58% in S3, while unskilled labour wages increased by 33.97% in S2 and 33.88% in S3.

Discussion

Theoretical implications. This study assesses the impact of RCEP on Taiwan's economic growth, labour demand, and wages. The key contributions of this study are as follows:

First, the RCEP has negative macroeconomic effects on non-member economies, such as Taiwan. Taiwan's GDP, social welfare, and international trade (including both imports and exports) have all suffered significant losses. In contrast, the member economies of RCEP have reaped varying degrees of benefits. The long-term impact is expected to be more significant than the short-term effects. This is consistent with previous studies. RCEP has been shown to boost the GDP (Ahmed et al., 2020) and welfare (Tian et al., 2022) of member countries, as well as promote trade (Wicaksono and Yuanfen, 2023) and foreign direct investment (Li et al., 2017). Furthermore, RCEP strengthens the position and participation of member countries in global value chains, with long-term effects expected to outweigh short-term gains (Wen et al., 2022). However, RCEP also poses significant challenges to non-member economies. For instance,

trade diversion is projected to result in losses of up to 11 billion USD for Chinese Taiwan and India (Park et al., 2021b).

Second, the RCEP has had a significant negative impact on Taiwan's labour demand and wages, while benefiting member economies. This finding is consistent with previous studies. By promoting trade liberalisation (Ejones et al., 2021), RTAs create new employment opportunities (Zhang, 2020) and raise real wages in member economies (Mughal et al., 2021). While the RCEP brings substantial benefits to member economies, it also results in considerable losses in wages and employment in non-member economies, such as China's Taiwan and India (Park et al., 2021b).

Additionally, this study examines the industry level and finds significant variations in the effects on the labour force across different industries and skill levels. This is in line with prior research. For example, the impact of RCEP on output across different industries varies by country (Lee and Itakura, 2018) and may exacerbate employment disparities across industries, gender, and skill levels (Wu et al., 2024).

Finally, the expansion of RCEP membership has further weakened Taiwan's total GDP, welfare, and trade in imports and exports, exacerbating the negative impact on Taiwan's labour demand and wages. However, Taiwan's accession to RCEP could help reverse these negative effects. This finding aligns with earlier research. For instance, Bangladesh's accession to RCEP has contributed to its trade expansion (Goswami et al., 2022). In contrast, India's decision to exit RCEP has not only deprived the country of export opportunities and participation in regional value chains, but it has also limited RCEP members' access to the Indian market (Gaur, 2022).

Practical implications. The practical implications of this study's results are as follows:

First, studies show that RCEP negatively impacts Taiwan's GDP, social welfare, and trade flows. Should Hong Kong join RCEP, this would not only exacerbate the negative effects of RCEP on Taiwan's economy but would also deepen the adverse impacts on Taiwan's labour demand and wages. While RCEP promotes trade and investment among member economies and enhances intra-regional economic integration, its trade diversion effects have gradually inhibited trade between RCEP members and Taiwan. As trade barriers between RCEP economies are reduced, members are more likely to import from within the region, further marginalising Taiwan. If Taiwan maintains its non-member status, it will continue to be excluded from RCEP's tariff and non-tariff preferences. This would lead to higher costs for intermediate goods imported from RCEP members, which in turn would affect Taiwan's industrial supply chains.

The case of Poland's accession to the European Union, which resulted in a 14% increase in per capita income, demonstrates that active participation in regional integration can yield significant benefits (Zonda et al., 2024). Therefore, Taiwan should proactively engage in discussions with mainland China, seeking to adopt a model similar to Hong Kong's and negotiating a free trade agreement with ASEAN based on a specific political arrangement. With mainland China's support, Taiwan could join RCEP at an appropriate level, thus benefiting from intra-regional trade and investment liberalisation.

Second, this study finds that the RCEP would have a negative impact on labour demand and wages in Taiwan. Since Taiwan is not yet a member of RCEP, it cannot directly benefit from the lower trade costs resulting from the reduction of tariffs and NTBs under RCEP. As a result, Taiwan's products lack price competitiveness in the RCEP regional market. As a small, open economy with limited internal resources, Taiwan relies heavily on imports for reprocessing. With the gradual emergence of RCEP's

trade diversion effects, Taiwan's exports become weaker, and its enterprises face inhibited export growth. This leads to a reduction in the scale of production and a corresponding decrease in labour demand and overall income for workers. Additionally, RCEP's rules of origin require products to meet 'in-region production' standards, which may prompt Taiwan's domestic enterprises to relocate production to RCEP member economies. This shift further reduces the overall demand for labour within Taiwan.

Since RCEP's impact on Taiwan primarily affects unskilled labour, and the Cross-Strait Economic Cooperation Framework Agreement between Taiwan and mainland China mainly covers traditional manufacturing sectors, there is a high degree of compatibility between these two. Therefore, Taiwan could seek to negotiate with mainland China on a political basis, expanding the product coverage of the Cross-Strait Economic Cooperation Framework Agreement, increasing tax reductions, consolidating production in traditional industries, promoting product exports, and using this agreement as a platform to deepen economic cooperation with RCEP members. Such measures could enable Taiwan to stabilise its external economic environment and reduce the risk of marginalisation.

Finally, this study highlights the differentiated impact of RCEP across various industries and skill levels in Taiwan. This does not necessarily imply a uniform decline in wages and labour demand across all sectors, but rather points to the potential for labour reallocation. For example, simulation results show that RCEP increases labour demand in Taiwan's agricultural and food processing industries. By reducing NTBs through measures such as international standard alignment and mutual recognition of certifications, RCEP makes it easier for Taiwan's agricultural and food products to enter member markets, which are sensitive to regulatory standards. Consequently, the reduction in trade barriers for these regulatory-sensitive products offers an opportunity for Taiwan's agricultural sector to expand.

In contrast, Taiwan's labour force is predominantly concentrated in the service sector, followed by manufacturing industries such as electronics, petrochemicals, and textiles. The most likely destination for workers from industries impacted by RCEP is the agricultural and food processing sectors. However, there are two constraints. First, workers from manufacturing industries like electronics and information may be reluctant to transition into low-skilled sectors such as agriculture and food processing, opting instead to shift into the service sector. Second, skilled labour tends to adapt more easily to shifts in trade and investment activities, while unskilled labour faces greater difficulty rejoining the workforce. Agricultural and food-processing enterprises may be willing to offer jobs but are reluctant to increase wages in order to control costs. This exacerbates income inequality within the labour force. Furthermore, given Taiwan's long-standing economic emphasis on the northern region over the southern region, the labour force in the south may face increased pressure.

In response to these challenges, trade unions and industrial organisations should provide appropriate unemployment relief and transition support for workers displaced by these changes, with a particular focus on unskilled labour. Unemployed individuals, particularly those with limited skills, should be encouraged to pursue vocational education and training to improve their qualifications and adapt to emerging job opportunities. Through such measures, the negative effects of RCEP on labour demand and wages in affected sectors can be mitigated as labour is reallocated.

Limitations and future research directions. First, while this study sheds light on the impact of RCEP on Taiwan's labour

market, it primarily focuses on the effects of trade changes on labour demand and wages. However, future research could more comprehensively explore the broader impact of RCEP on the labour force, particularly the long-term transformation of labour dynamics. Future studies could also investigate the effects of RCEP on labour supply, informal employment, occupational safety, labour rights, and education in Taiwan. Additionally, while this study offers valuable insights for economies with similar economic characteristics, further research is needed due to the limitations imposed by Taiwan's unique political status and the differences in economic structures and factor endowments across economies.

Second, this study uses the GTAP model to assess the effects of RCEP on labour demand, wages, and economic growth in Taiwan. The GTAP model is widely recognised for its value in trade policy analysis. However, it is a relatively static model based on assumptions such as perfectly competitive markets and constant returns to scale. These assumptions may make the model less responsive to real-world conditions. The comparative static nature of the model also limits its ability to capture potential adaptation strategies that might arise in response to policy changes. Future research could address this limitation by adopting a hybrid approach (e.g., incorporating a firm heterogeneity module) or by employing an alternative modelling framework. Additionally, due to resource and time constraints, this study lacks a robust sensitivity analysis of key parameters and the dynamic recursive dataset. Future research could consider expanding the GTAP model to enable sensitivity analysis of key parameters and datasets or supplementing the existing model with a general equilibrium gravity model.

Finally, this study does not provide a detailed analysis of specific barriers, such as regulatory differences, due to the inherent limitations of the GTAP model and the challenge of quantifying some NTBs. Future research could consider constructing CGE models that focus specifically on these barriers, tailored to particular industries or products. This would allow for a more nuanced understanding of the impact of regulatory differences and non-tariff measures on trade and economic outcomes. Additionally, due to the large volume of data required for this study, actual relevant data for 2023 has not been fully collected or made publicly available. As a result, this study uses forecast data from the Econmap database to update the model. Future research could consider exploring actual data to strengthen the analysis.

Conclusion

This empirical study, based on the GTAP model, underscores the significant impact of RCEP on Taiwan's economic growth and labour market. It highlights the critical role of trade creation and trade diversion in shaping RCEP's effects on Taiwan's labour market. Notably, the study reveals the unique phenomenon of 'reverse trade diversion,' which illustrates shifts in Taiwan's labour demand across different industries under various scenarios. These findings provide valuable insights for policymakers and stakeholders, enhancing their understanding of the potential impact of RCEP on the labour markets of non-member economies, while emphasising the importance of regional economic cooperation.

Data availability

The GTAP10 data that support the findings of this study are available from the Center for Global Trade Analysis in Purdue University's Department of Agricultural Economics but restrictions apply to the availability of these data, which were used under licence for the current study, and so are not publicly

available. Data are, however, available from the authors upon reasonable request and with permission of the Center for Global Trade Analysis in Purdue University's Department of Agricultural Economics. The other datasets generated and analysed during the current study are available from the corresponding author on reasonable request.

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Author contributions

All authors contributed to the study's conception and design. Conceptualisation: all authors; methodology: JZ and FL; software: JZ and FL; writing—original draft preparation: all authors; writing—review and editing: CL, JZ and CZ; visualisation: JZ. All authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

Competing interests

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Ethical approval

This article does not contain any studies with human participants performed by any of the authors.

Informed consent

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Additional information

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