



# **Bilateral Investment Agreement with Taiwan: Why should the Czech Republic say yes and support it at the EU level?**

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## A.1 Executive summary

- The following research study attempts to present relevant arguments for discussion about the potential bilateral investment agreement (BIA) between the EU and Taiwan and its implications for the Czech economy.
- The remoteness and relatively small size of the Taiwanese economy would suggest that potential impacts on Czech economy will be minimal. However, thanks to Taiwanese innovation-based comparative advantages in selected sectors, a deeper analysis reveals that Taiwan's real economic role is significantly bigger than the uninformed observer might expect.
- The BIA with Taiwan could create sound economic effects and exceed the potential benefits expected from a boost to mutual trade by FTAs between, for example, the EU and Vietnam, or the EU and New Zealand.
- European companies still face significant tariff rates in some agricultural and manufacturing sectors. The potential BIA with Taiwan would be beneficial for Czech and European exporters, as it would further reduce tariff rates and stimulate mutual trade.
- The BIA with Taiwan would help to improve and strengthen Czech access to vital components in the electronics and manufacturing industry, as Czech imports are dependent on Taiwanese suppliers in those sectors.
- Deeper tariff liberalization with Taiwan would benefit Czech exporters in the automotive sector, as cars are an important export article, representing more than 50 % of Czech exports to Taiwan and current tariffs on vehicles are as high as 17.5 %.
- Furthermore, the Czech Republic is a successful exporter of services to Taiwan, particularly manufacturing services and consulting services. The BIA should include not only import tariff reductions, but also address non-tariff barriers and barriers to the mobility of services.
- The Czech Republic is also the fourth-largest recipient of Taiwanese investments in Europe after the Netherlands, UK, and Germany. Czech companies are well positioned to attract further Taiwanese investments in manufacturing industries resulting from supply chain diversification after COVID-19.
- The EU is seeking to build partnerships to secure its post-COVID-19 technology resilience. As the EU continues to be dependent on Taiwan in semiconductors manufacturing, the BIA could initiate an alliance that would help to match Taiwanese and European comparative advantages in the semiconductors sector.
- The Czech Republic should carefully consider its strategy towards the region, as arguments supporting the BIA with Taiwan are robust from both an economic and strategic perspective.



## A.2 Introduction

For many years, the European Commission has hesitated to explore the possibilities of a bilateral investment agreement with Taiwan (BIA). Even though Taiwan is one of the most competitive economies in the world, the EU has closed trade deals with almost everyone in the region except Taiwan. As free-trade agreements with South Korea, Japan, Singapore, and Vietnam are being completed, there is still no specific timeframe regarding the launch of negotiations or even an impact assessment for Taiwan.

Apparently, there is still a need to highlight the innovativeness of the Taiwanese economy and the high number of benefits that Taiwan can offer to its trade partners. If the launch of the BIA negotiations was based solely on economic reasoning, the trade deal would have been signed by now. Since 2014, various academic organizations and think tanks have advocated the deal without any substantial results<sup>1</sup>

The COVID-19 outbreak has significantly changed how the regional situation is perceived in the EU. Global value chains are being redesigned, many long-established rules are undergoing an unprecedented reset, and the EU is currently trying to figure out what strategic autonomy and technology resilience could mean without endangering its status as a free-trade and export driven economic bloc.

On 26 November 2020, the European Parliament adopted a resolution on "the EU Trade Policy Review", which calls on the Commission to start a scoping exercise and impact assessment with Taiwan as soon as possible (European Parliament 2020). It is assumed that a successful EU-China Investment agreement should precede negotiations with Taiwan. However, it is reasonable to expect that the BIA with China will not resolve in the short term, as the deep-rooted differences between the EU and China in certain areas will not diminish overnight.

The following research is building arguments for decision makers in the Czech Republic and the EU to consider while assessing the economic and strategic importance of a BIA with Taiwan. It summarizes the current Czech-Taiwanese trade situation and presents relevant arguments for Czech-Taiwanese trade enhancement under a potential BIA. Furthermore, it presents economic and strategic gains from the European perspective.

The study can be divided into two key areas: 1) key arguments for supporting the BIA with Taiwan from the Czech and EU perspective and 2) a detailed background study of the BIA impacts on the Czech economy.

## A.3 Why should the Czech Republic support the BIA with Taiwan?

### 1. Taiwan is an important economic partner for the Czech economy.

Czech-Taiwanese trade relations are stable, with mutual trade growing steadily, except for a few fluctuations due to the global economic situation. Taiwanese companies play a significant role as investors, exporters, and job creators in Czech economy outputs. Taiwan's importance for Czech exports is comparable to European countries like Denmark or Ireland. (Figure A.1)

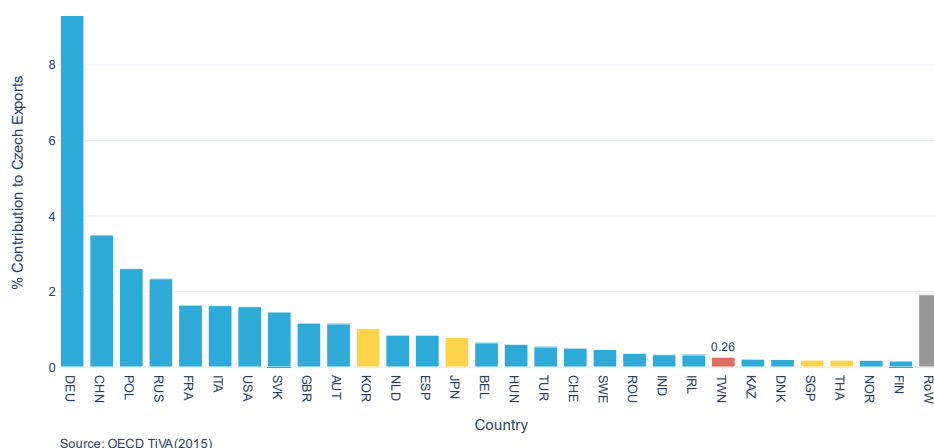
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<sup>1</sup> Dreyer, Iana, Frederik Erixon, Hosuk Lee-Makiyama, and Razeen Sally. Beyond Geopolitics - The case for a free trade accord between Europe and Taiwan. ECIPE Occasional Paper No.3/2010, Brussels: ECIPE, 2010; Reilly, Michael. Towards an EU-Taiwan Investment Agreement: Prospects and Pitfalls. Palgrave Macmillan, 2018; Copenhagen Economics. Taiwan: Enhancing Opportunities for European Business: Trade and Investment between the European Union and the Separate Customs Territory of Taiwan, Penghu, Knmen and Matsu. Copenhagen: Copenhagen Economics, 2008.



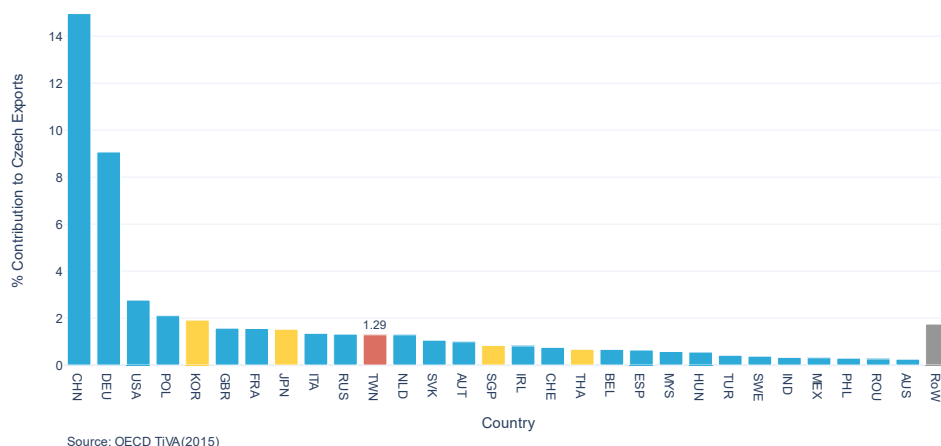


**Figure A.1:** Contribution of Other Countries to Czech Exports (% , TiVA 2015)



As Taiwan is a global powerhouse of the ICT industry, its importance for Czech exports naturally grows in this sector, as Figure A.2 presents. Moreover, the Czech branch of the Taiwanese company Foxconn is continuously ranked as the second-largest Czech exporter. In 2020, Foxconn was also the third on the list of Czech companies with the highest global export year-on-year increase (2018-2019).<sup>2</sup>

**Figure A.2:** Contribution of Other Countries to Czech Exports of ICT (% , TiVA 2015)



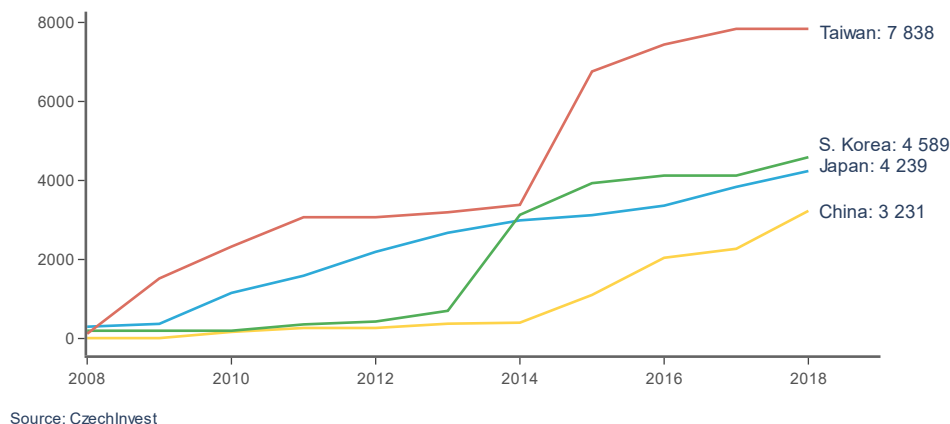
Among the East Asian countries, it is the Taiwanese companies that create the most job positions. Figure A.3 features direct jobs created via investments managed by CzechInvest.<sup>3</sup> It can be assumed that the total number will be slightly higher.

<sup>2</sup> Beneš, Miroslav. "Exportérem roku se stala automobilka Škoda Auto. Největší nárůst vývozu zaznamenala Tatra." Czech Chamber of Commerce. (online) 17 12 2020. [https://www.komora.cz/press\\_release/exporterem-roku-se-stala-automobilka-skoda-auto-nejvetsi-narust-vyvozu-zaznamenala-tatra/](https://www.komora.cz/press_release/exporterem-roku-se-stala-automobilka-skoda-auto-nejvetsi-narust-vyvozu-zaznamenala-tatra/) (accessed April 20, 2021).

<sup>3</sup> The data do not represent indirect effects on job creation (e.g., on domestic suppliers) and therefore do not reflect total jobs created.



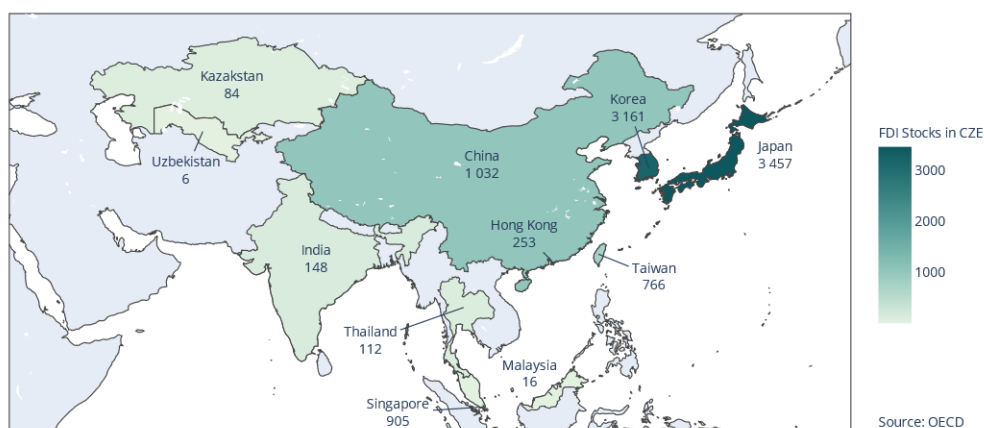
**Figure A.3:** Job Positions Created by Companies from East Asia (cumulative increase since 2008)



## 2. Czech Republic is one of the key receivers of Taiwanese FDI in Central and Eastern Europe.

Taiwanese investment in the Czech Republic plays a significant role in the Czech economy. Taiwan belongs among the key Asian investors in the Czech Republic, as Figure A.4 shows. In the past few years, however, there have been no new incentives for further cooperation. It would be beneficial to leverage Taiwanese companies' achievements in the Czech Republic to create new opportunities and encourage other Taiwanese firms to follow the example of their successful colleagues. The existing connections and environments can help to attract new projects in high-value-added sectors.

**Figure A.4:** FDI Stocks in the Czech Republic by Partner – TOP 10 Asian Partners in 2019 (ultimate counterparts, mil. USD)



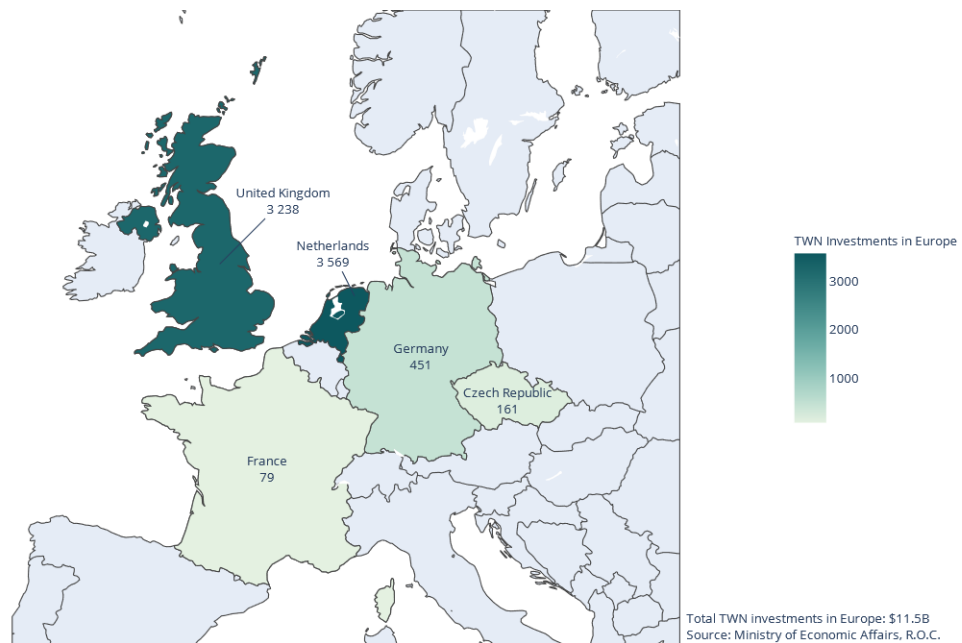


Furthermore, the Czech Republic is the fourth-largest recipient of Taiwanese investments in Europe (Figure A.5). From the FDI per capita perspective, the Czech Republic places third after the Netherlands and the United Kingdom. Germany and the Czech Republic are the key recipients of Taiwanese FDI in Central Europe.

With the turbulence of the US-China trade war and COVID-19-related supply chain shocks, many Taiwanese companies are rethinking their global plans and adopting the China Plus One<sup>4</sup> strategy more thoroughly. Companies like Foxconn or Pegatron are moving their production facilities outside China to the Southeast Asia region or closer to the final customer.<sup>5</sup>

As the Czech Republic and Germany have already attracted Taiwanese investments in various industries, they are well positioned to attract further relocations across the manufacturing industries. Moreover, there is a significant opportunity to outsource services to Central and Eastern Europe (CEE) thanks to digitalization and a large ICT talent pool.

**Figure A.5:** Taiwanese Investments in Europe (1952-2020, mil. USD)



<sup>4</sup> China Plus One is a business strategy to avoid investing only in China and diversify business into other countries.

<sup>5</sup> Lee, Yimou. "Foxconn to shift some Apple production to Vietnam to minimise China risk." Reuters. (online) 26.11.2020. <https://www.reuters.com/article/us-foxconn-vietnam-apple-exclusive-idUSKBN286oVN> (accessed 4 23, 2021).



### 3. Taiwan is an important and difficult-to-replace supplier of selected vital components.

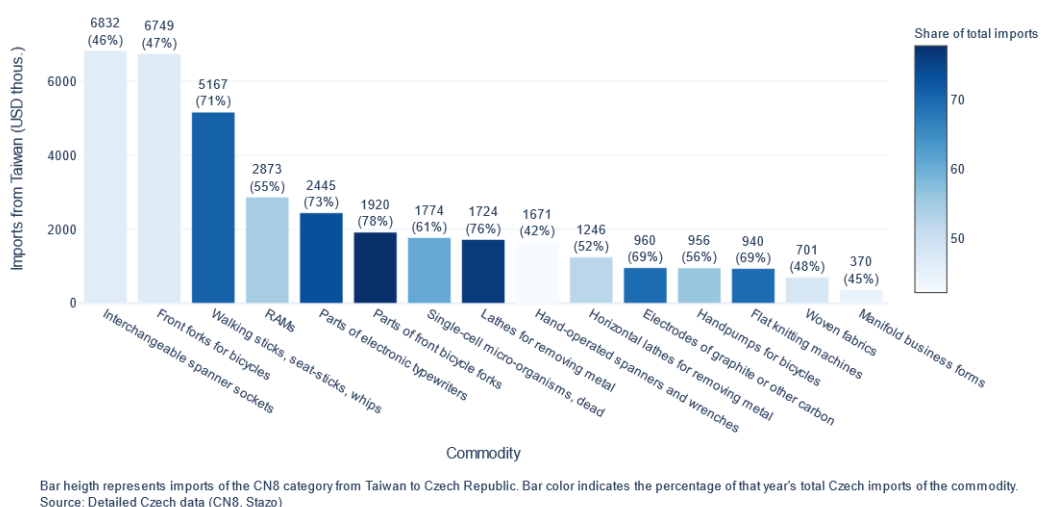
Czech imports are dependent on Taiwanese suppliers in 15 categories (Figure A.6). The most important “dependent” products are electronic components (especially electronic integrated circuits and RAM chips) and manufacturing equipment like lathes, drilling and broaching machines.

Import dependence in this particular case is defined by those imports from Taiwan which account for at least 40% of total Czech imports of the particular commodity and whose value is larger than 50 thousand USD (once we relax the criterion of 40 % import share, we can identify many more dependent products - see Figure C.5 for further details).

Looking closer, in electronic components and manufacturing equipment Taiwan is not only the crucial supplier for Czech companies but also for the world market. Hence any significant disruption in supplies of the dependent commodities would be difficult to replace from other markets.

Therefore, the BIA with Taiwan would help to improve and strengthen Czech access to those vital components. From the perspective of mutual trade dependencies the conclusion of the BIA is more important for the Czech Republic than for Taiwan, as the extent of the trade dependency of Taiwan on Czech exports is much lower (see Figure B.8 for further details).

**Figure A.6: Import Dependencies (Czech imports from Taiwan, 2020)**



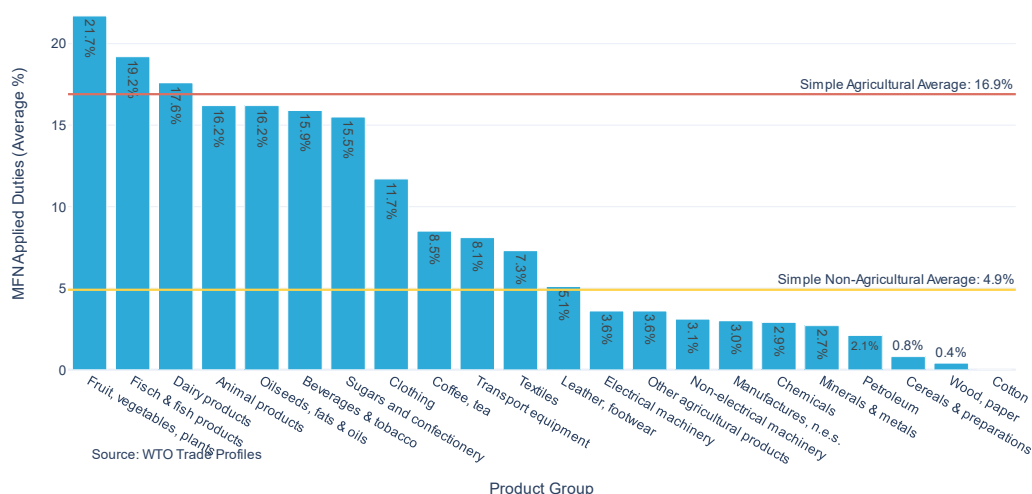


## 4. There is a space for further tariff-based liberalization

European companies still face significant tariff rates in the case of selected agricultural and non-agricultural sectors (Figure A.7). The simple averaged Most-Favoured Nation (MFN) applied tariffs on non-agricultural commodities reaches 4.9% and as usual it is substantially higher (16.9%) for agricultural products. Furthermore, tariffs, quotas and additional safeguards exist in the agriculture sector. The highest MFN tariffs on agricultural products amount to 500%; the most protected manufacturing products can be found in the sector of transport equipment (up to 30% rate) and non-electrical machinery (up to 18% rate).

The potential BIA with Taiwan would be beneficial for Czech and European exporters, as it would further reduce tariff rates and stimulate mutual trade.

**Figure A.7: Import Tariffs of Taiwan**



## 5. Potential economic gains from BIA with Taiwan are not negligible

The potential economic gains from the BIA with Taiwan are larger than the expected gains from several treaties of the EU which are either ratified, being negotiated, or have been put on hold.

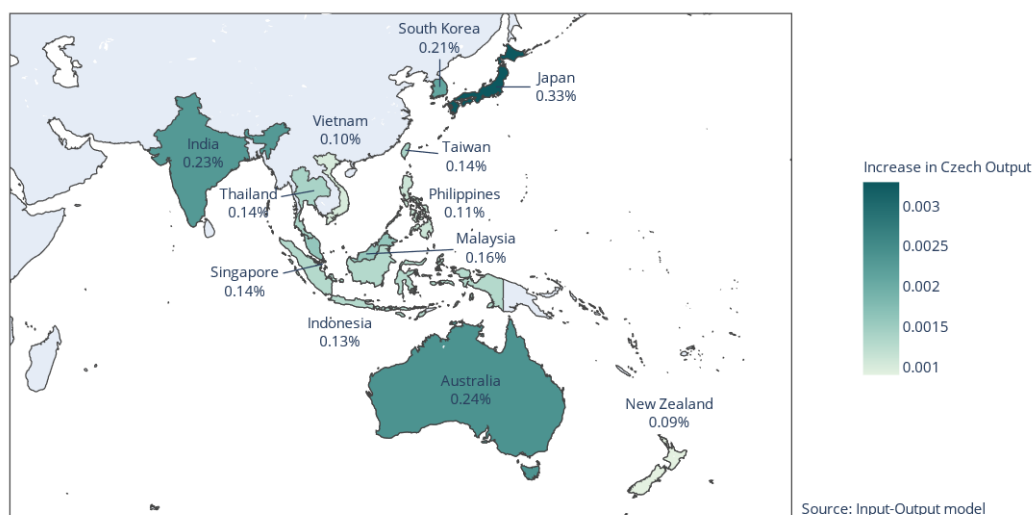
Using the Input-Output methodology and under the assumption that the treaty would double mutual trade flows between all EU member states and Taiwan, the output (value added) of the Czech Republic is expected to increase by 0.14% (0.12%). The Czech Republic reaches the 7<sup>th</sup> highest increase among the EU member states.

Even though potential gains from the BIA with Taiwan are lower than benefits expected from trade treaties between the EU and Japan or Australia, they are comparable to the effects of FTAs between the EU and Singapore or Thailand. Positive effects of the BIA with Taiwan are even higher than the impacts of FTAs between the EU and Vietnam (ratified in 2020), New Zealand (still being negotiated), or Indonesia (see Figure A.8). For further information about the methodology of the simulations see Chapter B.4. The comparison of the effects of the BIA with Taiwan on individual EU member states can be found in Figure C.2.



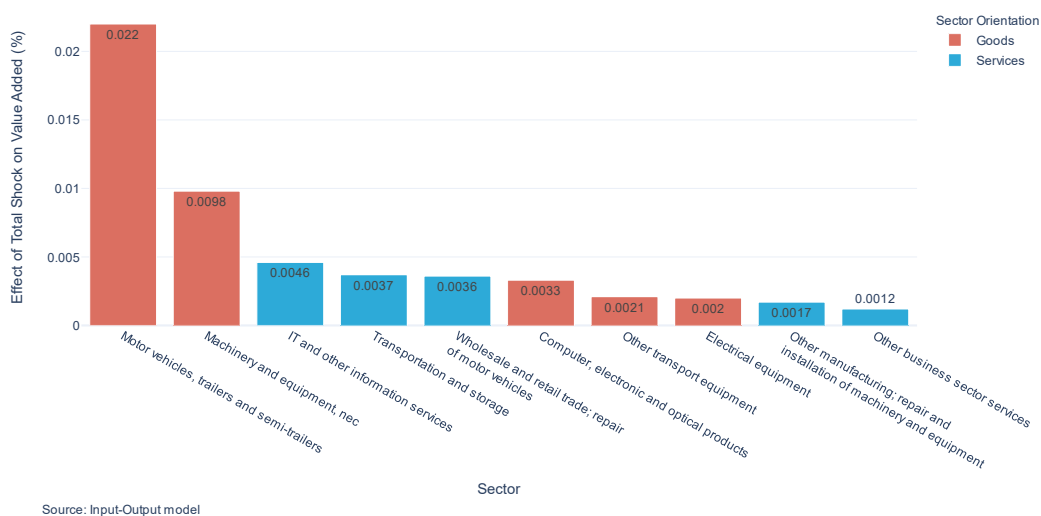
In fact, Taiwan is approximately in the middle of the ranking of the analysed Asia-Pacific countries. This outcome is supported also by a simple comparison of the results of various impact analyses of the EU's trade agreements which is presented in Figure C.1.

**Figure A.8: Simulated Impacts of BIA – Comparison with Other FTAs (Input-Output Model)**



The Czech automotive, machinery and IT manufacturing sectors are expected to benefit from the highest increase in the generated value added (see Figure A.9). However significant benefits are also expected in the case of several service sectors (e.g. IT services). For further information see Chapter B.4.

**Figure A.9: Top 10 Sectors with Highest Effects of Symmetric Liberalization - Results for the Czech Republic (Input-Output Model)**





The results presented above are further supported by estimates derived from the computable general equilibrium model (CGE).<sup>6</sup> The results show that the overall effects of deeper trade relations with Taiwan will be positive for the Czech Republic. Even though the euro-centric structure of Czech trade relations has implications for the absolute value of the positive effects, a comparison with other similar projects attempted by the EU in the Asia-Pacific region shows that the BIA with Taiwan would create outcomes comparable with other FTAs recently negotiated or attempted by the EU (Figure A.10).

The sector-level effects show relatively dramatic increases in exports of selected sectors to Taiwan, for four of the aggregate sectors this increase exceeds 100%, and for an additional two sectors, 80% (Figure A.11). The overall effects of these increases are, however, reduced by Taiwan's relatively smaller initial share in exports of some of the sectors and in some cases also the relatively smaller initial role of the sectors in the current Czech economy.

The automotive sector is assumed to reap the biggest benefits, when effects on overall value added in the Czech Republic and on overall exports of the sector are considered.

For further information and a detailed description of the utilized methodology please see Chapter B.5.

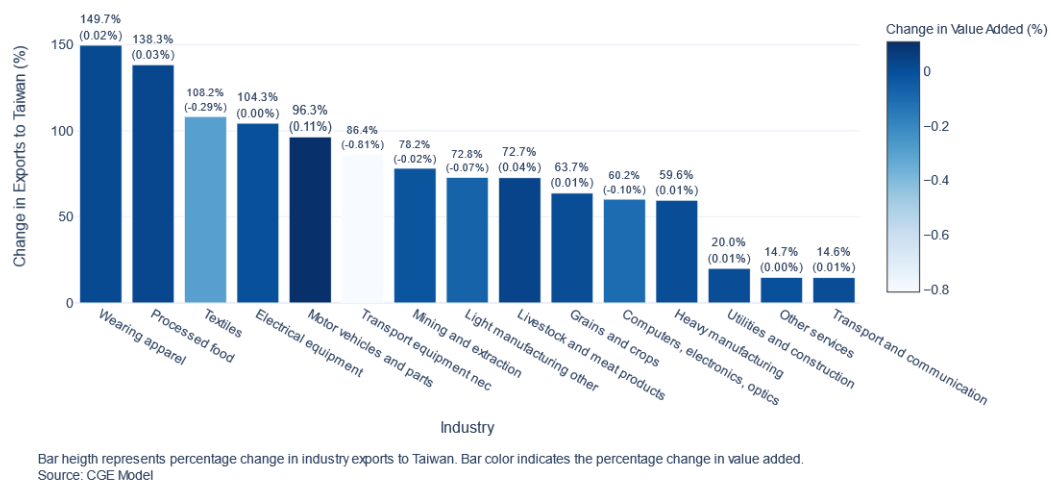
**Figure A.10: Simple Scenario: Overall Effects and Comparison with other FTAs (CGE Model)**



<sup>6</sup> By using the CGE model we are testing how much richer (and structurally different) countries would be if we compare a world with and without the trade liberalization projects but with everything else remaining the same (capital endowment, technologies, etc.). We call this change in welfare a change in "equivalent variation".



Figure A.11: Sectoral Effects (CGE Model)



Bilateral Investment Agreement with Taiwan: Why should the Czech Republic say yes and support it at the EU level?

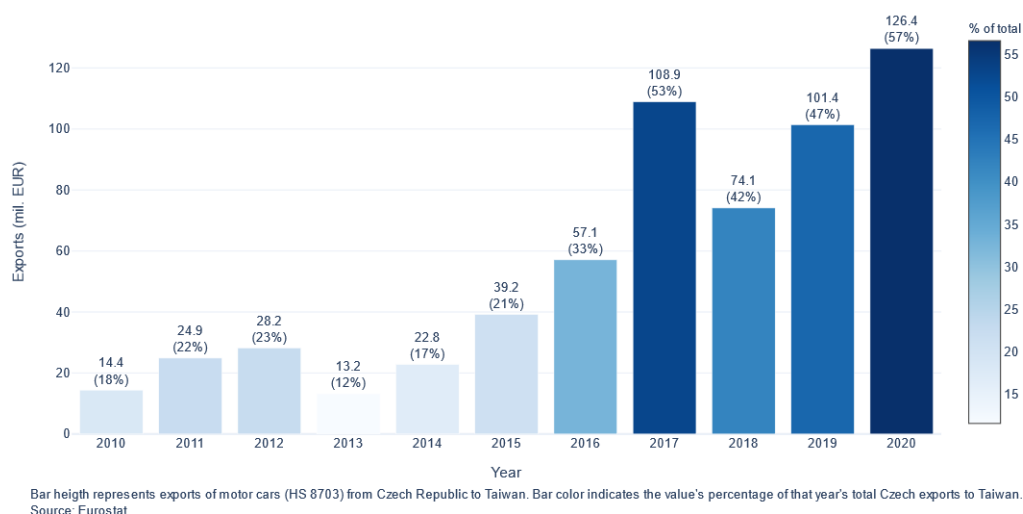




## 6. Czech automotive sector would benefit from BIA with Taiwan

From the perspective of the Czech economy, the highest benefits from the potential BIA can be assumed in the automotive sector (see Figure A.9 and Figure A.11). That sector is also the key driver of Czech exports to Taiwan, as Figure A.12 presents. Particularly in recent years exports to Taiwan in the automotive sector have surged, representing more than 50 % of Czech exports to Taiwan. Czech cars are generally popular in the Southeast Asia region, which could explain the fast year-on-year increases.<sup>7</sup> Current tariffs on vehicles are as high as 17.5 % of the customs value of the vehicle, so deeper tariff liberalization with Taiwan would benefit Czech exporters in the automotive sector.

Figure A.12: Czech Exports of Motor Cars (HS 8703) to Taiwan



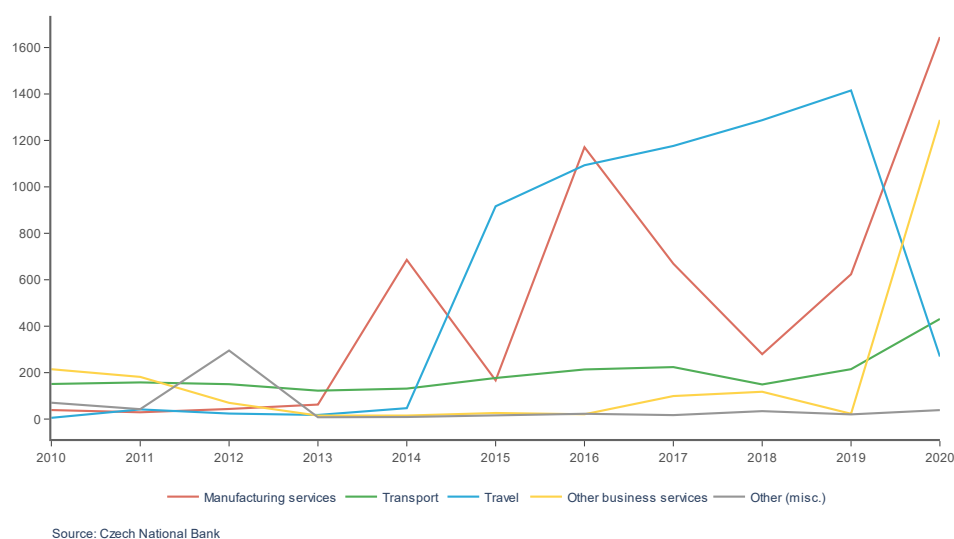
<sup>7</sup> Rauwald, Christoph. "VW Taps Skoda for Expansion Push in Elusive Emerging Markets." Bloomberg. (online) 29 3 2021. <https://www.bloomberg.com/news/articles/2021-03-28/vw-taps-skoda-for-expansion-push-in-elusive-emerging-markets> (accessed April 23, 2021).



## 7. Czech Republic is a successful services exporter to Taiwan

The Czech Republic is a successful exporter of services to Taiwan (Figure A.13). Rather unusually for such a distant market, most of the service credit items are not simply travel and transportation services, but almost 45% (in 2020) was related to manufacturing services and 35% to other business services (almost completely consisting of professional and management consulting services). Personal travel services amounted to only slightly less than 7% of services exports.

**Figure A.13: Role of Taiwan in Credit Items of Czech Current Account (mil. CZK)**



Given the fact that several service sectors shall also benefit from the considered BIA with Taiwan, the Czech Republic should require that the potential agreement includes not only import tariff reduction, but also that it addresses non-tariff barriers and barriers to the mobility of services.

## 8. Enhanced EU-Taiwan trade partnership is the key ingredient for EU tech resilience.

The EC has outlined a strategy that should respond to lessons learned from COVID-19 and enhance strategic autonomy in areas such as raw materials, batteries, pharmaceuticals, hydrogen, cloud and edge technologies, or semiconductors.<sup>8</sup> (EC 2021) The EU is seeking to diversify international supply chains and pursue international partnerships.

The role of Taiwan in reaching these ambitious goals is difficult to overlook. Taiwan is among the top 10 contributors to EU exports in sectors such as computers, electronics, and optical products (Figure A.14). Equally important is the role of Taiwan in service sectors related to IT and electronics, i.e., the sectors crucial for the current economy (Figure A.15).

The scarcity of semiconductors is one of the key concerns for the EU, as there will be no European digital sovereignty without an autonomous European capacity in microelectronics. Currently, Europe has no foundries that are able to manufacture components with feature sizes below 22 nm.<sup>9</sup> (EC 2021)

<sup>8</sup> EC. Annual Single Market Report 2021. Brussels, 5 May 2021.

<sup>9</sup> EC. Strategic dependencies and capacities. Brussels, 5 May 2021.

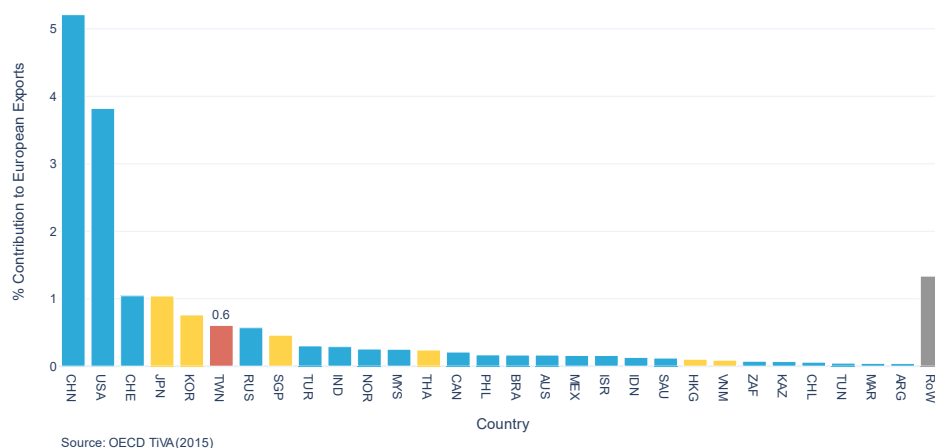


Taiwan is by far the leading foundry with a market share of more than 50 %. Taiwan Semiconductor Manufacturing Company (TSMC) together with Samsung are the only foundries with 7nm nodes (and smaller<sup>10</sup>), which are necessary to fabricate cutting-edge chips. Almost the entire fabless industry for cutting-edge chips relies on TSMC.

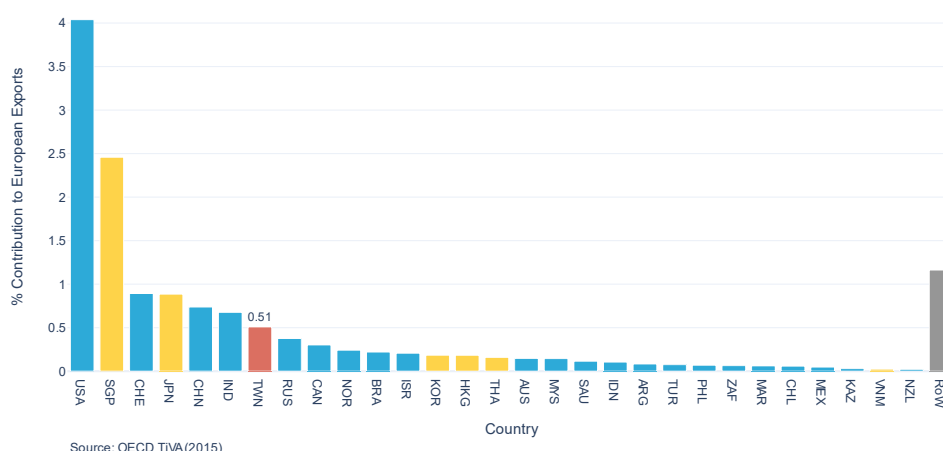
Taiwan also has the highest wafer fabrication capacity and together with South Korea, is currently the most important market for equipment vendors.<sup>11</sup> Due to companies such as ASE Group, Taiwan also dominates the outsourced semiconductor assembly and test market.

As the EU continues to be dependent on Taiwan for semiconductors manufacturing, the BIA could deepen the mutual trade relations and create a platform for cooperation in the semiconductors industry to secure European technology resilience. While Taiwan is a global leader in semiconductors manufacturing, it requires precision engineering and advanced materials, in which the EU can complement the value chain.

**Figure A.14: Contribution of other countries in European Exports of Computers, Electronics and Optical products, (% , TiVA 2015)**



**Figure A.15: Contribution of other countries in European Exports of IT and other information services (% , TiVA 2015)**



<sup>10</sup> TSMC is also working on 3nm and 2nm nodes.

<sup>11</sup> Wang, Lisa. "Taiwan retains lead in wafer capacity." Taipei Times. 27 June 2020. <https://www.taipeitimes.com/News/biz/archives/2020/06/27/2003738913> (accessed May 20, 2021).



# BACKGROUND ANALYSIS OF ECONOMIC IMPLICATIONS OF THE BILATERAL INVESTMENT AGREEMENT BETWEEN THE EU AND TAIWAN ON THE CZECH ECONOMY

## B.1 Introduction

For obvious reasons, attempts to discuss the deepening of trade relations between the EU and Taiwan are often stopped right at the outset. In spite of this the authors decided to present an evaluation of economic relations with Taiwan and of the possible effects of their deepening on the Czech Republic. We do not predict the probability of such an event, but we still assume that it is important and useful to know what such an agreement might bring – and what the EU and the Czech Republic would be losing if such deepening is not possible.

Our analysis shows that the real economic importance of Taiwan for the EU and for the Czech Republic exceeds its relatively small size. Indeed, there are Taiwan-produced commodities on which selected sectors of the Czech economy depend rather significantly and the role of Taiwan becomes even more significant when we consider the global value chains (GVC) perspective. Indeed, trade with Taiwan appears to be a relevant topic in current discussions on the resilience of the EU economy and on the GVCs important for EU companies. Taiwan's relatively small size should not be accepted as a simple excuse for inaction – as our results show, some of the trade agreements negotiated by the EU have had lower or comparable expected economic benefits for the Czech economy (and for the EU; see above).

The next section provides a traditional overview and simple descriptive analysis of mutual economic ties. Section 3 attempts a deeper structural analysis and projections based on input-output methods applied to OECD multiregional input-output tables (OECD ICIO). Section 4 provides a similar attempt based on computable general equilibrium models whilst section 5 provides an evaluation of the current relative relations based on benchmarks provided by gravity models.

As we are aware of the possible sensitivity of the topic, data used in the analysis as well as scripts for possible replication will be provided online

## B.2 Existing Economic Relations between Taiwan and the Czech Republic

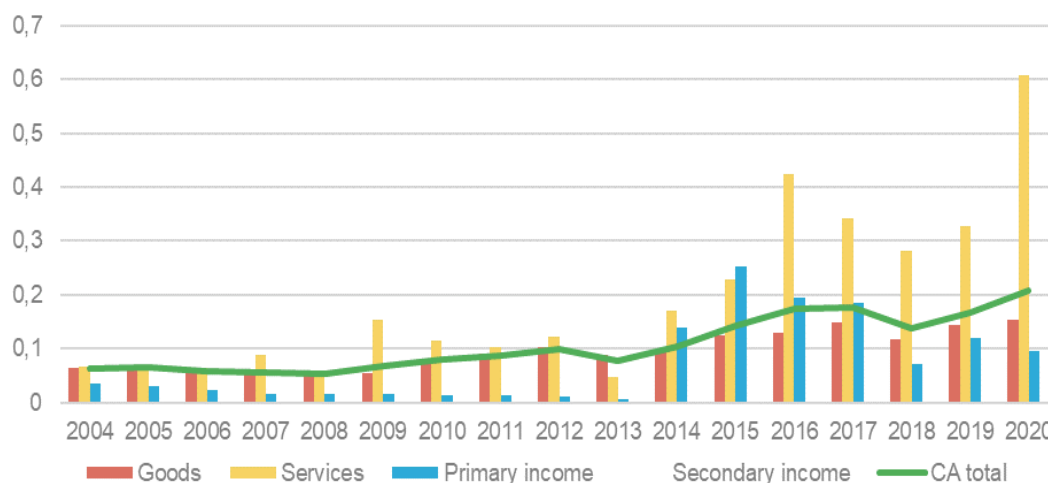
An evaluation of the current extent of mutual trade and investment relations between the Czech Republic and Taiwan can be more ambiguous than many non-economists realize. Both trade and investment data suffer from some methodological issues – investment data are influenced by the fact that the directly investing entity is not necessarily the ultimate one (and it does not have to have the same “nationality” either), whilst trade data are influenced amongst other things by the fact that most imports from Asia to the Czech Republic come via entry points in third EU countries. The complicated position of Taiwan also means that some international sources do not provide Taiwanese data, or the data are hidden under a different heading. Therefore, we have considered it rather important to describe not just the current relations, but to provide a broader perspective on differences between available data before presenting and evaluating the results of data analysis.



## Taiwan in Czech Current Account

The overall role of Taiwan in Czech current accounts amounts to approximately 0.2% of total credit flows and 0.6% of total debit flows. However, as shown in Figure B.1 and Figure B.2 respectively, these overall numbers hide significant differentiation at the level of individual items. The Czech Republic is a successful exporter of services to Taiwan (the total share of service-related credit items reached 0.6% in 2020), while on the debit side the merchandise imports account is the most important item (and reached almost 0.8% of total debit flows in the same year).

**Figure B.1: Taiwan in the Czech Current Account (Credit) - Role of Taiwan in Credit Items of Czech Current Account, % of total flows**

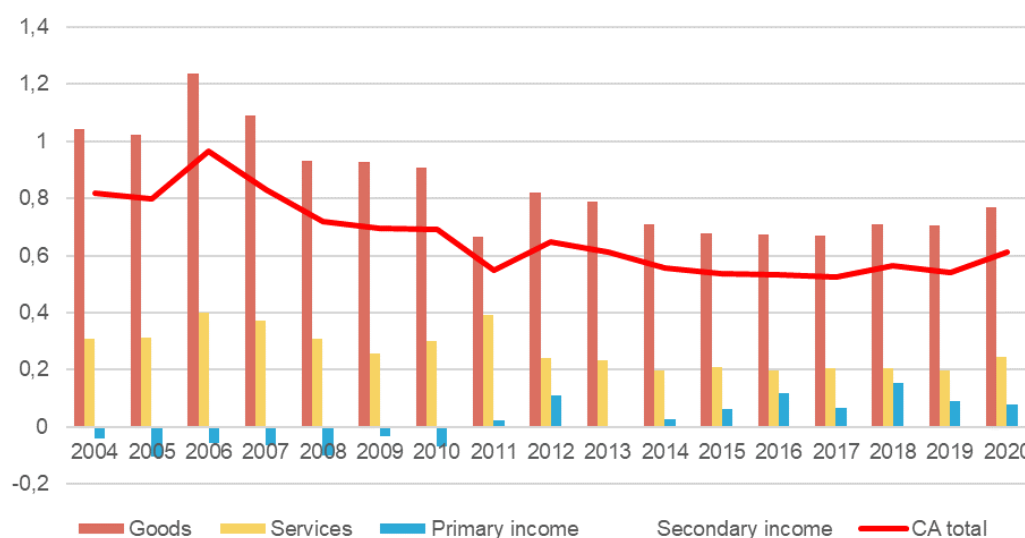


**Source:** Czech National Bank (ČNB)

The pattern of services exports (services in the credit account) is described in appendix C.3. (Figure C.3). Rather unusually for such a distant market, most of the service credit items are not simply travel and transportation services, but almost 45% (in 2020) was related to “Manufacturing services on physical inputs owned by others” and 35% to “Other business services” (almost completely consisting of “Professional and management consulting services”). Personal travel services amounted to only slightly less than 7% of service exports.



**Figure B.2:** Taiwan in Czech Current Account (Debit) - Role of Taiwan in Debit Items of Czech Current Account, % of total flows



Source: ČNB

Services imports were less important and consisted mainly of transportation services (90% of reported service-related debit flows), i.e. services linked largely to mutual merchandise trade. Merchandise trade will be analysed in section 2.

## Inward and Outward Foreign Direct Investment (FDI)

FDI statistics are traditionally obscured by problems with the determination of residence status of companies and by the rather complex nature of many investment projects. Data on investment relations with Taiwan are no exception to this rule; some Taiwanese FDI might be recorded as inward FDI from another country, on the other hand, some investment activities of investors from mainland China can be intertwined with Taiwanese investment activity.

Figure B.3 compares Czech data on inward stocks of Taiwanese FDI in 2019 with OECD data for the same year; the OECD data differentiate between immediate and ultimate investors. The data show that even though the official role of Taiwan was quite small in 2019, the alternative perspective based on the ultimate counterpart view reveals a significantly higher role of Taiwanese capital which reached almost 0.5% of all FDI stocks in the Czech Republic. This makes Taiwan the fifth most important Asian country for Czech inward FDIs and a more important partner than e.g., the much larger India (Figure B.4).

**Figure B.3: Czech FDI Inward Stocks from Taiwan (2019, mil. USD & %)**

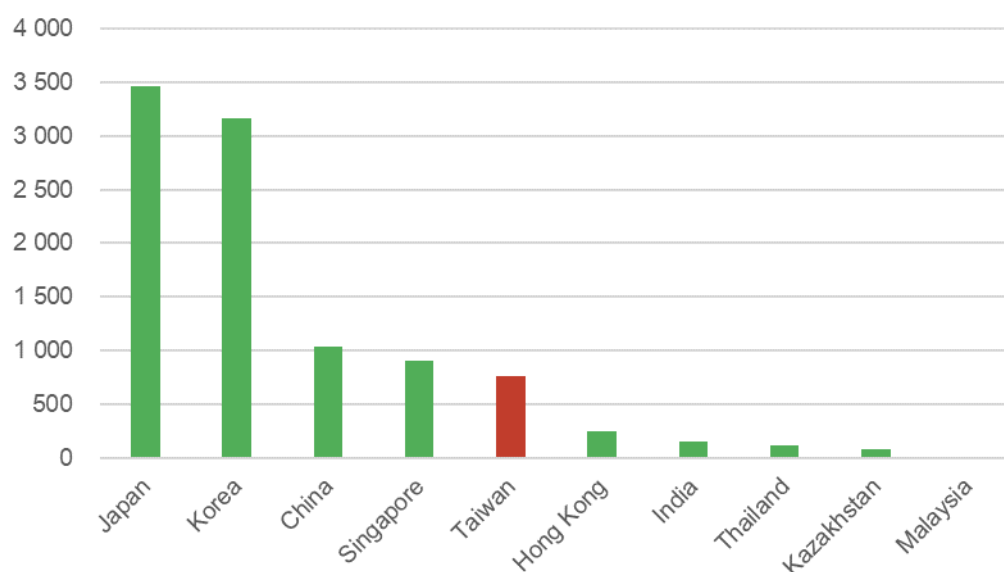
	mil. USD	%
ČNB <sup>12</sup> - immediate investor principle	20.2	0.01
OECD - immediate counterpart, all resident unit	46	0.03
OECD - ultimate counterpart all resident unit	766	0.45

Compiled by authors.

<sup>12</sup> Czech National Bank.



**Figure B.4: FDI Stocks in the Czech Republic by Partner – TOP 10 Asian Partners in 2019 (ultimate counterparts, mil. USD)**



**Source:** OECD

Official statistics (CNB) on breakdown by economic activities are sketchy (some items are described as confidential data), however it is clear that the 2019 stocks of Taiwanese investment in the Czech Republic consisted mainly of investment in services (70%), while manufacturing played a secondary role (30%). Almost 77% of the FDI in manufacturing came to the sector of “Computer, electronic and optical products”. The original data are provided in appendix C.4 (Figure C.4).

### **Trade Relations: Merchandise Trade**

The distance between both regions and the inland position of the Czech Republic imply that besides traditional problems (FOB/CIF prices in exports/imports, exchange rate conversions, errors and omissions) data on mutual trade can be sensitive to issues known as the Rotterdam effect. The extent of these and similar issues can be extremely important for the selection of adequate data as well as for the subsequent analysis and interpretation of effects of trade with Taiwan.

### **Trade Statistics: Mirror Data Comparison**

The following tables compare data on trade between the Czech Republic and Taiwan provided by official and reliable sources: Czech Statistical Office, UN Comtrade, CEPII statistics BACI and finally Taiwanese trade statistics. All the sources provide data in USD, data for year 2019 were used for the comparison.



**Figure B.5: - Czech Trade with Taiwan (2019, thousands USD)**

	Imports	Exports	Balance
ČSÚ	1,159,407	245,322	-914,085
Comtrade: Czech side	1,159,407	244,930	-914,477
Comtrade: Taiwanese side	454,327	365,039	-89,289
Taiwanese data	454,428	364,595	-89,834
CEPII (BACI)	811,619	284,289	-527,330

Compiled by authors.

None of the provided sources is explicitly better than the other, as we can see, official Czech data show that Czech imports from Taiwan are more than 2.5 times higher than exports to Czechia reported by Taiwanese authorities. BACI data are between the Czech and Taiwanese numbers, this is because the BACI statistics were designed to help researchers with similar types of discrepancies. Unless reported otherwise, BACI data are used in this text.

Discrepancies also exist on the export side, but they are significantly smaller. This is fairly typical for Czech (and other small EU countries') trade with more distant territories. This situation also implies that derived indicators such as balance of trade can also differ by a wide margin: the Czech trade balance deficit with Taiwan came to either 89.3 mil. USD (Taiwanese data) or 914.1 mil. USD (Czech Statistical Office) in 2019. Similar discrepancies can exist at the level of individual products or sectors too.

## Trade Dependencies

The analysis of trade dependencies is based on detailed 8-digit data for 2020 provided by the Czech Statistical Office (CN8) and on HS6 BACI data for 2019. The former source was used for the identification of simple direct export and import dependencies at detailed product level; the latter source for the more precise identification of actual import dependencies, i.e. sectors where not only Taiwan plays a high role in Czech imports, but replacing it as a source would be complicated because Taiwan plays a similarly high role also in overall EU imports and a non-negligible role in global markets in general.

Figure B.7 shows imported items for which imports from Taiwan account for at least 40% of total Czech imports of the particular commodity and the value of which exceeded 50 thousand USD (a more detailed version of the same table which lists products where the share was at least at 20% is provided in appendix C.5, Figure C.5). The products were further sorted according to their customs classification. As apparent from the results, there were 15 categories which met the afore-mentioned criteria, and besides some less usual products that do not play any major role they also included electronic components (most importantly electronic integrated circuits, RAM chips) and also manufacturing equipment lathes. If we reduce the threshold to 20%, the number of products related to these two categories increases but bicycles and bicycle components become the categories with the highest value of imports in the table (see appendix C.5, Figure C.5 for details).

Using a very similar approach, we can also find Czech export sectors for which Taiwan plays a rather significant role. Figure B.8 shows the resulting data (criteria: at least 20% of Czech exports of the category and value of exports at least 50 thousand USD). The number of similar sectors is smaller (this corresponds with the export patterns of the Czech Republic), and they include two sectors more typical for





the manufacturing traditions of the Czech economy (glass, motorcycle components) and two rather specific products. The implications are relatively straightforward and logical – Taiwan is currently much more crucial for the Czech economy as a source of selected vital components, whilst there are not so many sectors of the Czech economy for which this distant market should constitute a dominant target market.

When we complement the criteria based on the role of the flow from Taiwan in Czech trade (20%) with additional constraints (minimum share of imports from Taiwan in overall EU27 imports equal to 20%, minimum share of Taiwanese exports in global market of the commodity), we are left with one commodity only (Figure B.6): Wrench sockets, etc. (HS6 code 820420).<sup>13</sup>

**Figure B.6: Import dependence - Czech Republic (HS6. Based on BACI data, 2019)**

Code	Commodity	Taiwanese exports to the Czech Republic (thous. USD)	Share in total Czech imports of the commodity (%)	Share in total EU imports of the commodity (%)	Global role of Taiwan (%)
820420	Wrench sockets, etc.	3218	22	31	38

**Source:** BACI data

<sup>13</sup> A high share of imports from a particular country does not automatically mean strong dependence on the country. However, if this share is significant and the country also demonstrates a high share of global trade in the given product category (i.e. there are very few other suppliers), then the dependency is much more likely.



**Figure B.7: Import Dependencies - detailed Czech data (CN8, Stazo, 2020)**

CN8	Commodity	Imports from Taiwan (USD thous.)	Share in Total Imports (%)
21022090	Single-cell micro-organisms, dead (excl. packaged as medicaments and yeasts)	1774	60.8
48204000	Manifold business forms and interleaved carbon sets, of paper or paperboard	370	44.7
54074200	Woven fabrics of filament yarn containing $\geq 85\%$ nylon or other polyamides by weight, incl. monofilament of $\geq 67$ decitex and a maximum diameter of $\leq 1$ mm, dyed	701	48.0
66020000	Walking sticks, seat-sticks, whips, riding-crops and the like (excl. measure walking sticks, crutches, firearm-sticks and sports sticks)	5167	71.0
82041200	Hand-operated spanners and wrenches, incl. torque meter wrenches, of base metal, adjustable (excl. tap wrenches)	1671	42.2
82042000	Interchangeable spanner sockets, with or without handles, of base metal	6832	46.4
84142020	Handpumps for bicycles	956	56.0
84472080	Flat knitting machines (excl. warp knitting machines, incl. Raschel type)	940	69.4
84581180	Horizontal lathes for removing metal, numerically controlled (excl. turning centres and automatic lathes)	1246	52.5
84589180	Lathes for removing metal, numerically controlled (excl. horizontal lathes and turning centres)	1724	76.1
84735020	Electronic assemblies equally suitable for use with two or more electronic typewriters, word-processing machines, calculating machines or other machines, equipment or devices of heading 8470 to 8472, n.e.s.	2445	73.5
85423245	Electronic integrated circuits as static random access memories "static RAMs", incl. cache random-access memories "cache-RAMs" (excl. in the form of multichip or multi-component integrated circuits)	2873	54.7
85451900	Electrodes of graphite or other carbon, for electrical purposes (excl. those used for furnaces)	960	69.5
87149130	Front forks for bicycles	6749	46.7
87149190	Parts of front forks, for bicycles	1920	77.8

**Source:** Stazo.



**Figure B.8: Export Dependencies - detailed Czech data (CN8, Stazo, 2020)**

Code	Commodity	Value of Exports to Taiwan (USD thousands)	Share of Taiwan in Total Exports
72210010	Bars and rods of stainless steel, hot-rolled, in irregularly wound coils, containing by weight $\geq 2,5\%$ nickel	186	77.8
87141040	Silencers "mufflers" and exhaust pipes, and their parts, of motorcycles "incl. mopeds"	593	57.0
05079000	Tortoiseshell, whalebone and whalebone hair, horns, antlers, hooves, nails, claws and beaks, unworked or simply prepared, their powder and waste (excl. cut to shape and ivory)	898	47.3
70134991	Glassware of a kind used for table or kitchen purposes, gathered by hand (excl. toughened glass and glass having a linear coefficient of expansion $\leq 5 \times 10^{-6}$ per kelvin within a temperature range of 0 to 300°C, glassware of glass	971	23.6

Source: Stazo

## Revealed Comparative Advantages

The traditional Balassa (1965) index of revealed comparative advantages can identify sectors in which the Czech Republic appears to be a more capable exporter than the reference group. We analyzed normalized RCA indices calculated from BACI data at several levels of detail and with two different reference groups (EU and global exports) for two types of export relationships (overall exports, exports to Taiwan only).

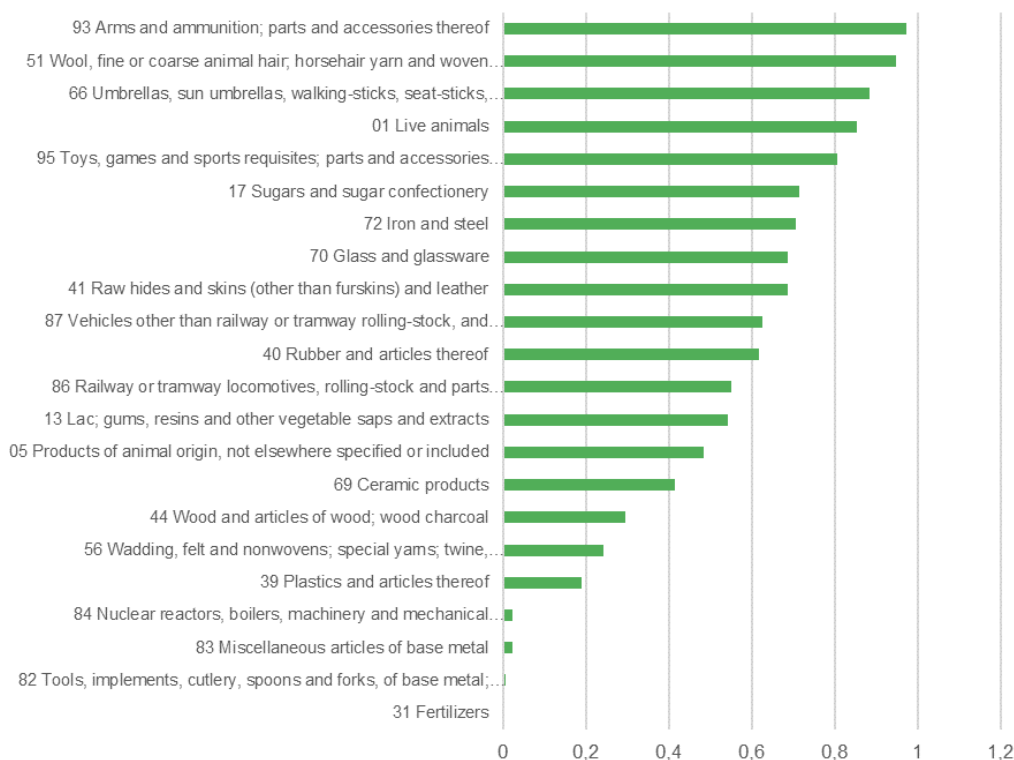
These indices can show us which sectors would be likely to experience the highest increase in the case of trade liberalization. RCA indices which use the EU as a reference group show sectors where the Czech Republic is likely to be successful if the trade between the EU and Taiwan experiences an elimination of mutual trade barriers. RCA indices based on overall Czech exports which use the world as the reference group can add to this picture sectors (products) which might not have been included in the former results because no EU members export them to the target market.

A less detailed version of the indicator is presented in Figure B.9. Czechia was relatively better at exporting all the indicated chapters to Taiwan than the rest of the EU, the chapters include amongst other sectors Arms and ammunition, Vehicles (including Railway and Tramways), but also a number of selected categories of light industry (optics).

A more detailed version of the indicator identified 484 products (HS6 level), with the highest number of these (71) coming from HS chapters 84 (Nuclear reactors, boilers, machinery and mechanical appliances; parts thereof) and 85 (Electrical machinery and equipment and parts thereof; sound recorders and reproducers, television image and sound recorders and reproducers, and parts and accessories of such articles). The list of the top 15 chapters (ranked by the number of products with identified RCAs) is provided in appendix C.6 (Figure C.6).



**Figure B.9: - Normalized RCA on HS Chapters Level (2019, reference group EU, exports to TW only)**



**Source:** BACI data

## B.3 Taiwan: Trade Policies

In spite of its complicated international status, Taiwan became a member of the WTO in 2002 under the complex name “Separate Customs Territory of Taiwan, Penghu, Kinmen and Matsu”. This means that the Czech Republic as well as other EU countries enjoy the MFN treatment and rather predictable trade environment (binding coverage for both agriculture and non-agriculture products equals 100%).

The WTO membership together with the institutional quality provides to Czech exporters significantly better guarantees of both adequate treatment and enforcement of their rights than in many other economies of East and South-East Asia.

Still, space for tariff-based liberalization does exist and even in non-agricultural sectors relevant for the Czech Republic (see Figure B.10). The simple average MFN applied tariffs on non-agricultural commodities reaches 4.9% and as usual it is substantially higher (16.9%) for agricultural products. Furthermore, tariffs, quotas and additional safeguards exist in the agriculture sector. The highest MFN tariffs on agricultural products amount to 500%; the most protected manufacturing products can be found in the sector of transport equipment (up to 30% rate) and non-electrical machinery (up to 18% rate).



**Figure B.10: Taiwan, Import Tariffs**

Product groups	Final bound duties				MFN applied duties			Imports	
	AVG	Duty free in %	Max	Binding in %	AVG	Duty free in %	Max	Share in %	Duty free in %
Animal products	16.1	3.2	45	100	16.2	3.2	45	0.6	0.2
Dairy products	17.6	0	76	100	17.6	0	76	0.2	0
Fruit, vegetables, plants	21.8	9.3	425	100	21.7	9.9	425	0.7	9.3
Coffee, tea	8.5	41.7	32	100	8.5	41.7	32	0.2	40.8
Cereals & preparations	31.1	6	377	100	0.8	11	377	1.2	30.5
Oilseeds, fats & oils	16.4	55.7	338	100	16.2	55.7	338	0.7	87.8
Sugars and confectionery	55	0	143	100	15.5	5.9	28	0.2	3.8
Beverages & tobacco	16.3	17.3	40	100	15.9	17.3	40	0.6	55
Cotton	0	100	0	100	0	100	0	0.1	100
Other agricultural products	3.9	58.8	500	100	3.6	61.5	500	0.4	54.7
Fish & fish products	19.2	3.8	113	100	19.2	3.6	113	0.6	13.8
Minerals & metals	2.9	52.7	13	100	2.7	56.6	13	18.1	85.6
Petroleum	5.2	6.9	10	100	2.1	44.9	5	10.4	94.8
Chemicals	2.8	25.8	20	100	2.9	25.4	20	13.5	44.6
Wood, paper	0.4	94.1	13	100	0.4	94.5	13	1.8	94.9
Textiles	7.5	3.2	13	100	7.3	3.2	13		2.4
Clothing	11.7	0	12	100	11.7	0	12	0.7	0
Leather, footwear	5.6	13.3	10	100	5.1	14.1	10	1.1	14.2
Non-electrical machinery	3.6	28.3	20	100	3.1	25.7	18	13.9	68.6
Electrical machinery	3.5	36.2	15	100	3.6	28.5	15	23.8	87.8
Transport equipment	7.9	26.8	30	100	8.1	26.2	30	4.7	35.2
Manufactures, n.e.s.	3	39.6	10	100	3	35	10	5.4	75.7

**Source:** WTO Trade Profiles



## B.4 Effects of Deepening of Trade Ties: Input-Output Analysis

As already indicated in the section which provided the GVC-based overview of mutual trade relations, traditional cross-border trade statistics are becoming less and less relevant in the era of global value chains. An adequate attempt at exploring future opportunities in trade relations should therefore take into account the presence of trade in intermediates and the resulting patchwork of indirect exports.

Input-output analysis and input-output tables provide both traditional instruments and traditional data usable for this analysis. Therefore, we decided to use the input-output methods for both explorative analysis and projections of effects of simple scenarios of increased trade relations with Taiwan.

### Available Data and Methodology

We used available multi-regional tables which include both EU countries and Taiwan, i.e. the tables published within the WIOD projects and the OECD ICIO tables. However, while these tables remain popular sources of input-output data, they are not exactly up-to-date. The latest table from the WIOD project provides a snapshot of global economic relations in 2014, the ICIO tables provide slightly newer data: 2015. Unfortunately, the newly published Eurostat tables (Figaro project) do not explicitly include Taiwan as a separate region. However, wherever appropriate, we attempted to extrapolate the estimated results with available data on the role of Taiwan in trade flows of the analyzed countries.

The methods used in the analysis are derived from the traditional open input-output model. We consider the effects of two types of shocks:

1. Symmetric expansions of the demand for commodities and services intended for final use and exported from a country (or set of countries) to Taiwan; i.e. only the vectors of final use are assumed to change.
2. Symmetric expansion of the Taiwanese demand for commodities and services intended for both final and intermediate use. In this case the shock influences the structure of the transactions matrix as well as the vector of final use (more details are provided in Appendix IX).

### Simple Scenario: Czechia-level shock only

The first scenario considers a rather unrealistic event, a liberalization that would lead to a symmetric increase of all Czech merchandise and service exports to Taiwan while EU exports remain unchanged. This type of scenario is unrealistic in its nature because of the EU-wide common trade policy, but it is presented for two reasons:

1. The effect of the shock is easier to extrapolate convincingly with the use of the data on the role of Taiwan in the Czech current account which means that we can get an idea on the changes of the dimensions of possible effects during 2016-2020.
2. A comparison with the effects of an EU-wide shock provides a simple way to evaluate the relative contribution of the indirect effects of liberalization.

The effects of this limited liberalization (applied to the 2015 data) are shown in the following table (Figure B.11). The results show that if we focus on the effects of the expansion of direct trade with Taiwan, the effects are at a level which corresponds to



the share of Taiwan in Czech exports of value added to Taiwan. This positive trade shock would increase Czech value added approximately by 0.1% (if extrapolated to 2019 data).

**Figure B.11: Effects of Czechia-only Trade Expansion**

Type of shock: 100% symmetric increase in mutual trade Year: 2015	Final Demand only	Final and Intermediate Demand – 2015	Final and Intermediate Demand – Extrapolated to 2019
Increase in Czech Output [%]	0.04%	0.08%	0.05% - 0.13%
Increase in Czech Value Added [%]	0.04%	0.07%	0.05% - 0.13%

**Source:** authors

## EU-Wide Increase in Trade with Taiwan

The second type of scenario shows the effects of a symmetric increase in trade between all EU member countries and Taiwan. In this case the Czech economy benefits both from direct and indirect trade linkages (e.g. increased German exports to Taiwan requiring additional input imported from the Czech Republic). Again, similar types of levels of shocks are considered (only final demand, and a combination of final demand and intermediate demand).

The effects of EU-wide trade expansion (applied to the 2015 data) are shown in Figure B.12 and they are indeed significantly higher; Czech value-added experiences an additional boost thanks to the indirect effects of exports of other EU countries to Taiwan.

**Figure B.12: Effects of EU-Wide Trade Expansion**

Type of shock: 100% symmetric increase in mutual trade Year: 2015	Final Demand only	Final and Intermediate Demand – 2015
Increase in Czech Output [%]	0.07%	0.14%
Increase in Czech Value Added [%]	0.06%	0.12%

**Source:** authors

## IO-Based Comparison with Other FTAs

While the assumed scenarios can be easily rejected as ad hoc, they can still provide us with an interesting comparison of the relative relevance of the possible expansion of trade relations with Taiwan in contrast with other FTAs which have either been negotiated or proposed recently. The EU is currently negotiating trade agreements with four partners (Australia, Indonesia, New Zealand, Philippines), trade agreements with another rather diverse 24 partners (USA, India, but also Thailand or Myanmar) were attempted but put “on hold” for various reasons (see appendix C.8).



For the comparison we have selected countries according to the following criteria:

- The EU has negotiated an agreement with the country since 2010 (or it has at least made an unsuccessful attempt during that period).
- The country is in the Asian or Pacific region
- The country is included in the OECD ICIO statistics.

The criteria leave us with:

- Four countries with ratified agreements (Vietnam, South Korea, Singapore, Japan).
- Four countries with currently negotiated agreements (Australia, Indonesia, New Zealand, the Philippines)
- Three countries from the category of countries where the negotiations stalled during 2010-2021: India, Malaysia, Thailand.

The fact that the comparison is based on the 2015 version of the OECD ICIO statistics does not constitute a problem here as for most of the countries the 2015 data represent a period before such an agreement might have had a chance to influence trade. A partial exception is the agreement with Korea which – while formally ratified in 2015 – has been provisionally applied since 2011. Therefore, we also provide an alternative estimate for Korea based on the 2010 data (Figure B.13).

**Figure B.13: Comparison with Other FTAs.**

Type of shock: 100% symmetric increase in mutual trade Year: 2015	Increase in Czech Output [%]	Increase in Czech Value Added [%]
Japan	0.33%	0.28%
South Korea - 2015	0.32%	0.27%
India	0.23%	0.21%
Australia	0.24%	0.20%
South Korea - 2010	0.21%	0.18%
Malaysia	0.16%	0.14%
Singapore	0.14%	0.13%
Taiwan	0.14%	0.12%
Thailand	0.14%	0.12%
Indonesia	0.13%	0.11%
Philippines	0.11%	0.09%
Vietnam	0.10%	0.08%
New Zealand	0.09%	0.08%

**Source:** authors.

As is apparent from Figure B.13, if we attempt to estimate the results of an identical proportional shock in existing exports of goods and services from the EU to a possible (or existing) party to an FTA with the EU, then the overall effects of a possible expansion of trade with Taiwan are rather competitive. They are comparable with the possible effects of trade expansion with Singapore or Thailand, and exceed the effects of a trade expansion with Vietnam, Indonesia or New Zealand. Even the implications





of an expansion of trade with South Korea are not qualitatively different if we consider the 2010 data. In fact, Taiwan would be approximately in the middle of the ranking of the analysed Asia-Pacific countries.

At the same time, the Czech Republic is not exceptional as far as the overall effects of similar trade expansion is concerned; in fact, in terms of the effects on value added it places 11th amongst the current 27 EU countries. For the top three countries of the EU (Germany, Netherlands, and Ireland respectively) a similar shock would lead to an increase in their GDP of more than 0.2% (see appendix C.2 for the full list).

## Sector-Level Sensitivities

The same methodology can also be used to evaluate relative sensitivity to export expansion at the level of individual sectors. The analyzed scenarios reveal what would happen with the value added generated in the Czech economy if EU27 exports in the tested sector increase by a given percentage (100% in the basic case). The resulting data (Figure B.14) describes the interests of the Czech Republic – it would benefit most from the expansion of export opportunities in the sectors “motor vehicles, trailers and semi-trailers” and “Machinery and equipment, nec”. However, while the two manufacturing sectors dominate, several service sectors are also relatively high in the ranking. The Czech Republic should therefore require that the potential agreement includes not only import tariffs, but also that it addresses non-tariff barriers and barriers to the mobility of services.

**Figure B.14: Top 10 Sectors with Highest Effects of Symmetric Liberalization - Results for the Czech Republic.**

Sector	Sector name	Effect of Total Shock on Value Added in %
18	Motor vehicles, trailers and semi-trailers	0.0220
17	Machinery and equipment, nec	0.0098
28	IT and other information services	0.0046
24	Transportation and storage	0.0037
23	Wholesale and retail trade; repair of motor vehicles	0.0036
15	Computer, electronic and optical products	0.0033
19	Other transport equipment	0.0021
16	Electrical equipment	0.0020
20	Other manufacturing; repair and installation of machinery and equipment	0.0017
31	Other business sector services	0.0012

**Source:** authors.



## B.5 Effects of Deepening of Trade Ties: CGE Analysis

The input-output based results presented in the previous section can provide an evaluation of the current role of Taiwan in Czech (and European) trade relations, but the calculated implications of increases in mutual trade are still rather simple extrapolations and projections which assume rather schematic behaviour by producers and consumers. Most importantly, though, the results indicate what would happen if exports increase, but they do not provide a direct answer on how much exports might increase. The latter question can be at least partially answered by gravity models, but more complex evaluations of effects (including welfare effects) of future trade liberalizations are typically based on computable general equilibrium models (CGE) which much more naturally account for possible structural changes and responses to changes in relative prices induced by specializations.

CGE models have also been used in numerous previous attempts at evaluations of effects of trade policies (and trade liberalization projects) considered by the EU, which offers us a chance to cross-check our results with existing estimates.

### Modelling Issues

CGE models are a popular and commonly used method for evaluations of effects of trade policy shocks/liberalizations. Unfortunately, they are also rather complex and their calibration requires relatively high volumes of specific types of data (input-output tables, matching trade flows and data on existing trade policies). Furthermore, the ideal application would be based on the knowledge of the complete design of future liberalization – which is not available at the moment.

The results therefore do not represent the most realistic prediction of possible effects of an FTA between the EU and Taiwan, rather, they represent a response to a different question:

- If we use the GTAP model to predict the effects of simple scenarios of trade liberalization between the EU and other countries with which the EU has signed or negotiated trade agreements during the past 8 years, what would be the relative position of the hypothetical agreement with Taiwan? Could it provide at least as good welfare effects as a comparable agreement with another country?

In other words, we are using the GTAP framework in a way very similar to the use of the IO models in the previous section and we present a kind of horse race between the FTA projects attempted by the EU. All FTAs are evaluated rather schematically, and under the same conditions.

### Design of the Model(s)

The results in this section are based on simulations of a standard comparative static GTAP model calibrated on version 10 of the GTAP database with the reference year 2014. More details on the standard GTAP model are provided by Brockmeier (2001) and Hertel & Tsigas (1997).

The model preserves the original closure of the basic GTAP model, including the assumptions about labour markets (static supply of labour), perfect competition assumption and standard sets of elasticity and factor mobility parameters. Most importantly, due to limited space and time we used a comparative static version of the model rather than a more modern dynamic (recursive version).



In other words, we are testing how much richer (and structurally different) the countries would be if we compare a world with and without the trade liberalization projects but with everything else remaining the same (capital endowment, technologies, etc.).

Structure of the model:

- Number of regions: 25
- Number of sectors: 18 (full list provided in the appendix)
- Number of factors of production: 5

Types of shocks considered:

- Complete elimination of mutual tariffs (TMS variable) between the Czech Republic (+ the EU) and Taiwan.
- Increased efficiency of mutual trade: this attempts to model possible changes in non-tariff measures. Assumption: gap related to iceberg-type trade and transaction costs is reduced by 5% and 10%.

## Simple Scenarios: Overall Effects

The first table (Figure B.15) describes the results of a set of experiments in which trade with potential partners of trade agreements was liberalized. The table reports only increases in equivalent variations for the Czech Republic, the results thus indicate that this form of liberalization would make Czech citizens richer – the effects of the FTA are equivalent to a situation in which the incomes of Czech citizens increase by 12 mil. USD, resp. 26 mil. USD for our two liberalization scenarios. As we can see, deeper liberalization is likely to increase the positive effects for Czech citizens.

**Figure B.15: Simple Scenario: Overall Effects and Comparison with other FTAs**

Type of shock: complete elimination of tariffs on all flows + reduction of “iceberg-type” costs by 5% [1] or 10% [2]	Increase in Czech Equivalent Variations (mil USD) EU-TWN only [1]	Increase in Czech Equivalent Variations (mil USD) EU-TWN only [2]
Thailand	229.6	320
Australia	149.9	226.4
South Korea	89	206.7
New Zealand	109	139.5
Singapore	63.5	96.3
Japan	-24.48	91.32
Malaysia	27.8	52.2
India	11.9	38.8
Taiwan	12.1	26.1
Indonesia	8.9	20.82
Philippines	-8.5	-4.1
Vietnam	-21.2	-40.8

**Source:** authors.



## Simple Scenario #1: Additional Details

The results confirm the Euro-centric focus of current Czech external trade relations. The assumed extent of trade liberalization (complete elimination of trade tariffs and reduction of other trade barriers and costs by 5% relative to the benchmark year 2014) leads to relatively high effects on exports of products and services to Taiwan (the next section) which however translate into rather small overall macroeconomic effects in terms of overall output and value/volume of exports at the level of the whole economy.

Again, a similar pattern of results is not new or unexpected, it is a standard feature of attempts to evaluate effects of extra-EU trade liberalization on the Czech economy. However, the overall welfare effects remain positive (positive change in equivalent variations is equivalent to a net increase in average income of Czech households), these positive effects are achieved partly by changes in the structure and value of production and exports and partly by price changes with positive effects on the real value of Czech income (Figure B.16).

**Figure B.16: Impacts on the Czech Republic**

Effects on Czechia	Simulated Change [1]
Equivalent variations	+12.05 mil USD
GDP price index	-0.01%
GDP quantity index	0.02%
Volume of merchandise exports	0.01%
Value of merchandise exports	0.00%

**Source:** authors

## Simple Scenario #1: Effects by Sectors

The sector-level effects show relatively dramatic increases in exports of selected sectors to Taiwan, for four of the aggregate sectors this increase exceeds 100%, and for an additional two sectors, 80% (Figure B.17). The overall effects of these increases are, however, reduced by Taiwan's relatively smaller initial share in exports of some of the sectors and in some cases also the relatively smaller initial role of the sectors in the current Czech economy.

As far as effects on overall value added in the Czech Republic and on overall exports of the sector it is the sector "Motor vehicles and parts" which is linked to the biggest positive effects.



**Figure B.17: Sectoral Effects**

Industry	Change in Exports to TW (%)	Change in Output (%)	Change in Value Added (%)	Change in Aggregate Exports (%)
Grains and crops	63.72	0.01	0.01	-0.00
Livestock and meat products	72.67	0.04	0.04	0.07
Mining and extraction	78.17	-0.02	-0.02	-0.02
Processed food	138.29	0.03	0.03	0.06
Textiles	108.24	-0.29	-0.29	-0.36
Wearing apparel	149.67	0.02	0.02	0.02
Light manufacturing other	72.79	-0.07	-0.07	-0.09
Motor vehicles and parts	96.35	0.11	0.11	0.12
Transport equipment nec	86.44	-0.81	-0.81	-0.33
Electrical equipment	104.35	-0.00	-0.00	0.01
Computers, electronics, optics	60.21	-0.10	-0.10	-0.09
Heavy manufacturing	59.57	0.01	0.01	0.02
Utilities and construction	19.97	0.01	0.01	0.07
Transport and communication	14.60	0.01	0.01	0.04
Other services	14.66	0.00	0.00	0.06

**Source:** authors.



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## Appendix

### C.1 Impact Analyses of EU's Trade Deals

The expected welfare gains from trade liberalization between the EU and Taiwan seem modest once they are compared with trade deals between the EU and large developed economies such as Japan, the US or China (see Figure C.1).

However, once we compare expected welfare gains from the potential EU-Taiwan trade agreement with estimated impacts of the EU's deals with South Korea or Vietnam, we observe relatively high potential benefits.

The expected welfare gains from trade liberalization between the EU and Korea are approximately double the size of the estimated welfare gains of a trade deal between the EU and Taiwan (see Figure C.1 or the estimates of Copenhagen Economics (2008:66)). This difference can be attributed to two factors: the smaller size of Taiwan's economy and lower levels of "pre-liberalization" tariffs when compared to South Korea<sup>14</sup>.

When we compare expected welfare gains from the considered trade liberalization between the EU and Taiwan with the estimated impacts of the EU-Vietnam trade agreement, we can observe comparable results in case of ambitious trade liberalization between the EU and Vietnam (see Figure C.1).

However, it is important to mention that any comparison of the estimated welfare gains which are presented in various impact studies on the EU's trade agreements (Figure C.1) must be taken with a certain amount of caution. The estimated figures are sensitive to the models' assumptions and their parameters. The studies also vary in terms of the baseline year and their projected horizon. Therefore, the figures may represent welfare gains priced in different baseline years.

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<sup>14</sup> Copenhagen Economics. Taiwan: Enhancing Opportunities for European Business: Trade and Investment between the European Union and the Separate Customs Territory of Taiwan, Penghu, Knmen and Matsu. Copenhagen: Copenhagen Economics, 2008; Dreyer, Iana, Frederik Erixon, Hosuk Lee-Makiyama, and Razeen Sally. Beyond Geopolitics - The case for a free trade accord between Europe and Taiwan. ECIPE Occasional Paper No.3/2010, Brussels: ECIPE, 2010.





**Figure C.1 Results of selected impact analyses of EU trade deals**

			EU-JPN	EU-US	EU-CHN <sup>2</sup>	EU-KOR	EU-AUS	EU-NZL	EU-TWN	EU-VNM	EU-MEX	EU-CHL	EU-JOR	EU-TUN	EU-EGY
Change in economic welfare (% of GDP) <sup>1</sup>	EU	conservative scenario	0.34	0.27	0.02	0.03			0.01		0.001				
		ambitious scenario	1.9	0.48	0.05				0.02		0.02				
	Partner country	conservative scenario	0.27	0.21	0.02	0.31			0.5		0.02				
		ambitious scenario	0.67	0.39	0.07				1.19		0.36				
Change in economic welfare (bn. EUR,) <sup>1</sup>	EU	conservative scenario	42	48	2.096		2.6	2.6	1.02	1.9	0.082	0.269			
		ambitious scenario	320	86	7.011		4.8	4.8	1.95			2.4	0.712		
	Partner country	conservative scenario	5	33	0.425		0.9	0.4	1.59	6	0.16	0.369			
		ambitious scenario	18	65	1.405		1.8	0.6	3.78			3.2	0.529		
Equivalent variation (%)	EU	conservative scenario													
		ambitious scenario													
	Partner country	conservative scenario											2.8%	9.1%	2.2%
		ambitious scenario													
Partner´s GDP as a % of EU´s GDP (year 2019)			32.93%	137.07%	91.72%	10.53%	8.90%	1.34%	3.91%	1.68%	8.12%	1.78%	0.29%	0.25%	1.93%
Deal status (source: EC)			A	D	D	A	C	C	E	A	B	B	A	B	A
Source of data			(2012:44)	EC (2013:50)	EC (2013:31)	C.C.,Ifo I.(2018:112)	EC (2017:21-2)	EC (2017:21-2)	Copen.Econ. (2008:65)	EC (2019:35-6)	EC (2015:34)	Ecorys - CASE (2017:211)	Ecorys (2014:62)	Ecorys (2013:56)	Ecorys (2014:66)

**Notes:**

<sup>1</sup> Definition of welfare gain based on or close to equivalent variation.

<sup>2</sup> Figures represent reciprocal-high spillovers scenario.

<sup>3</sup> A=In place, B= In place and being modernised (actively or put on hold), C= Being negotiated, D= On hold, E=No agreement,



### Figure C.1 Source of data

European Commission. Impact Assessment Report on EU-Japan Trade Relations. Brussels, 2012.

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## C.2 Potential Effects of the EU-Taiwan BIA on Individual EU Countries

The presented estimates were derived from the input-output analysis. Its detailed methodology can be found in Chapter B.4

**Figure C.2: Potential Effects of the EU-Taiwan BIA on Individual EU Countries**

EU Country	Effect of Total Shock on Value Added in %
Netherlands	0.24
Germany	0.20
Ireland	0.20
Luxembourg	0.20
Denmark	0.15
Austria	0.15
Malta	0.14
Hungary	0.13
Sweden	0.13
Cyprus	0.13
Greece	0.12
Czechia	0.12
Belgium	0.11
Italy	0.11
Estonia	0.11
Finland	0.10
France	0.10
Slovenia	0.09
Slovakia	0.09
Spain	0.08
Lithuania	0.07
Portugal	0.07
Poland	0.07
Bulgaria	0.07
Romania	0.06



Croatia	0.06
Latvia	0.04

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### C.3) Service Exports to Taiwan

Figure C.3: Service Exports to Taiwan (2010-2020, mil. CZK)

Credit											
Item	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Services	480.7	453.3	582.8	225.7	888.2	1,303.8	2,521.3	2,185.6	1,867.8	2,296.9	3,672.9
Manufacturing services on physical inputs owned by others	38.9	29.3	43.5	62.5	685.7	166.8	1,170.8	669.2	279.6	623.6	1,645.2
Maintenance and repair services n.i.e.	12.7	5.0	2.3	0.1	0.3	1.0	1.3	0.4	19.7	2.3	1.3
Transport	151.2	157.9	150.3	122.4	131.3	177.0	213.7	223.9	149.2	214.9	431.3
Sea transport	5.8	0.7	1.2	1.1	0.3	0.4	3.8	2.8	5.6	1.7	9.3
Air transport	28.4	28.9	33.3	51.3	48.1	74.8	67.2	41.2	31.6	29.9	223.5
Other modes of transport	116.9	128.4	115.8	70.0	82.1	101.5	142.3	179.6	111.7	182.7	190.6
Postal and courier services	0.0	0.0	0.0	0.1	0.8	0.3	0.4	0.3	0.3	0.5	7.9
Travel	5.4	41.7	23.8	17.8	47.0	916.4	1,093.2	1,176.3	1,287.2	1,415.2	269.3
Business	0.0	36.0	19.0	8.0	2.0	10.0	9.0	15.0	16.0	20.0	14.2
Personal	5.4	5.7	4.8	9.8	45.0	906.4	1,084.2	1,161.3	1,271.2	1,395.2	255.1



Construction	0.0	0.0	0.0	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0
Insurance and pension services	3.3	3.8	4.4	5.5	5.8	7.8	8.3	9.4	8.4	9.7	10.9
Financial services	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.1	0.0
Charges for the use of intellectual property n.i.e.	10.4	10.0	4.1	0.5	0.3	0.6	0.6	0.1	0.3	0.3	7.1
Telecommunications, computer, and information services	13.5	17.4	283.7	1.3	1.6	7.1	10.1	6.0	5.1	6.1	19.1
Other business services	214.7	181.7	69.9	15.1	15.2	26.2	20.8	99.2	117.7	22.9	1,288.4
Research and development services	0.0	0.0	0.0	0.0	0.0	3.7	0.0	0.9	0.2	1.9	1.2
Professional and management consulting services	177.6	159.6	62.6	4.3	9.2	11.2	10.7	88.0	106.7	9.7	1,237.1
Technical, trade-related, and other business services	37.1	22.1	7.3	10.7	6.0	11.3	10.1	10.3	10.8	11.3	50.1
Personal, cultural, and recreational services	0.0	0.0	0.2	0.4	0.3	0.9	2.3	1.1	0.6	1.7	0.3
Government goods and services n.i.e.	30.5	6.3	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Services not allocated	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

**Source of data:** ČNB, OBI – Current account in geographical breakdown



## C.4 Inward Stocks – Breakdown by Sector

Figure C.4: Inward Stocks – Breakdown by Sector (2019, mil. USD)

NACE Rev.2	Contents	Registered capital	Reinvestment of earnings	Other capital	Sum
C	MANUFACTURING	27.2	63.6	-84.6	6.2
C19T22	Petroleum, chemicals, pharmaceutical, rubber and plastic products			C	C
C24_25	Basic metals and fabricated metal products			C	C
C26	Computer, electronic and optical products	C	C	-86.0	4.8
C28	Manufacture of machinery and equipment n.e.c.			-0.2	-0.2
C30	Manufacture of other transport equipment			C	C
C_OTH	Other manufacturing (leather, furniture, electrical equipment, repair and installation)			0.8	0.8
GTU	TOTAL SERVICES	10.0	0.1	4.0	14.0
G	WHOLESALE AND RETAIL TRADE; REPAIR OF MOTOR VEHICLES AND MOTORCYCLES	10.0	0.1	4.0	14.0
K	FINANCIAL AND INSURANCE ACTIVITIES			C	C
_T	TOTAL except for private purchases and sales of real estate	37.1	63.7	-80.6	20.2
FDI_T	TOTAL	37.1	63.7	-80.6	20.2

Source of data: ČNB

C: confidential



## C.5 Import Dependencies: Czech CN8 Data

Figure C.5: Import Dependencies (detailed Czech CN8 data)

CN8	Commodity	Import from Taiwan (USD thous).	Share in Total Czech Imports [%]
87149190	Parts of front forks, for bicycles	1920	77.8
84589180	Lathes for removing metal, numerically controlled (excl. horizontal lathes and turning centres)	1724	76.1
84735020	Electronic assemblies equally suitable for use with two or more electronic typewriters, word-processing machines, calculating machines or other machines, equipment or devices of heading 8470 to 8472, n.e.s.	2445	73.5
66020000	Walking sticks, seat-sticks, whips, riding-crops and the like (excl. measure walking sticks, crutches, firearm-sticks and sports sticks)	5167	71.0
85451900	Electrodes of graphite or other carbon, for electrical purposes (excl. those used for furnaces)	960	69.5
84472080	Flat knitting machines (excl. warp knitting machines, incl. Raschel type)	940	69.4
21022090	Single-cell micro-organisms, dead (excl. packaged as medicaments and yeasts)	1774	60.8
84142020	Handpumps for bicycles	956	56.0
85423245	Electronic integrated circuits as static random access memories "static RAMs", incl. cache random-access memories "cache-RAMs" (excl. in the form of multichip or multi-component integrated circuits)	2873	54.7
84581180	Horizontal lathes for removing metal, numerically controlled (excl. turning centres and automatic lathes)	1246	52.5
54074200	Woven fabrics of filament yarn containing >= 85% nylon or other polyamides by weight, incl. monofilament of >= 67 decitex and a maximum diameter of <= 1 mm, dyed	701	48.0
87149130	Front forks for bicycles	6749	46.7





82042000	Interchangeable spanner sockets, with or without handles, of base metal	6832	46.4
48204000	Manifold business forms and interleaved carbon sets, of paper or paperboard	370	44.7
82041200	Hand-operated spanners and wrenches, incl. torque meter wrenches, of base metal, adjustable (excl. tap wrenches)	1671	42.2
87149610	Pedals for bicycles	1595	38.8
87119000	Motorcycles, incl. mopeds, and cycles fitted with an auxiliary motor and side cars for motorcycles (excl. electric or with reciprocating internal combustion piston engine)	3966	37.6
87116010	Bicycles, tricycles and quadricycles, with pedal assistance, with an auxiliary electric motor with a continuous rated power <= 250 W	14606	36.9
84596910	Tool milling machines for metals, not numerically controlled	157	36.3
29375000	Prostaglandins, thromboxanes and leukotrienes, their derivatives and structural analogues, used primarily as hormones	612	35.8
70191910	Slivers and yarn of glass filaments (excl. glass filaments in chopped strands of a length of <= 50 mm and rovings)	3032	35.6
87149930	Luggage carriers for bicycles	1579	35.3
85234130	Optical discs for laser reading systems, unrecorded, of a recording capacity > 900 megabytes but <= 18 gigabytes, non-erasable "DVD-/+Rs"	367	33.9
59069100	Knitted or crocheted textile fabrics, rubberised, n.e.s.	132	32.6
87149690	Parts of pedals and crank-gear for bicycles, n.e.s.	1447	30.5
87149910	Handlebars for bicycles	793	30.3
84581141	Horizontal single spindle automatic lathes for removing metal, numerically controlled	935	30.1
63039210	Curtains, incl. drapes, and interior blinds, curtain or bed valances of nonwovens of synthetic fibres (excl. awnings and sunblinds)	100	28.2



87120030	Bicycles, not motorised, with ball bearings	25078	27.6
66039090	Parts, trimmings and accessories for umbrellas and sun umbrellas of heading 6601 or for walking sticks, seat-sticks, whips, riding-crops and the like of heading 6602 (excl. handles and knobs, and umbrella frames, incl. frames mounted on shafts "sticks")	1138	27.0
95061121	Monoskis and snowboards	622	26.2
87141050	Clutches and parts thereof, of motorcycles "incl. mopeds"	83	26.2
85423211	Electronic multi-component integrated circuits "MCOs" as memories as specified in note 9 (b) (4) to chapter 85	365	25.9
39209921	Polyimide sheet and strip, non-cellular, uncoated, or coated or covered solely with plastic, not reinforced, laminated, supported or similarly combined with other materials, not worked or only surface-worked, or only cut to rectangular, incl. square, shapes (excl. self-adhesive products, and floor, wall and ceiling coverings in heading 3918)	1811	24.1
87149950	Derailleur gears for bicycles	1442	23.5
87149630	Crank-gear for bicycles	770	22.8
85423231	Electronic integrated circuits as dynamic random-access memories "D-RAMs", with a storage capacity of <= 512 Mbit (excl. in the form of multichip or multi-component integrated circuits)	1104	22.6
93069090	Ammunition and projectiles and parts thereof, n.e.s. (excl. for military purposes)	117	22.2
96072090	Parts of slide fasteners (other than of base metal)	304	21.6
29147900	Halogenated, sulphonated, nitrated or nitrosated derivatives of ketones or quinones (excl. chlordecone "ISO" and inorganic or organic compounds of mercury)	278	21.5
73181499	Self-tapping screws of iron or steel other than stainless (excl. spaced-thread screws and wood screws)	8273	21.3
87019210	Agricultural tractors and forestry tractors, wheeled, of an engine power > 18 kW but <= 37 kW (excl. pedestrian-controlled tractors)	5796	21.1
84602910	Grinding machines for cylindrical surfaces, for finishing metals, metal carbides or cermets, in which the positioning of any one axis can be set up to an accuracy of >= 0,01 mm, not numerically controlled (other than gear finishing machines)	75	20.9



90049010	Spectacles, goggles and the like, corrective, protective or other, with lenses of plastics (excl. spectacles for testing eyesight, sunglasses, contact lenses, spectacle lenses and frames and mountings for spectacles)	2940	20.3
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**Criteria used:** Share of Taiwan higher than 20% of overall Czech imports, value of imports exceeding 50 thousand USD



## C.6 Revealed Comparative Advantages

Figure C.6: RCAs - Top 15 chapters (ranked by the number of products)

HS Chapter	Description	Number of products
84	Nuclear reactors, boilers, machinery and mechanical appliances; parts thereof	71
85	Electrical machinery and equipment and parts thereof; sound recorders and reproducers, television image and sound recorders and reproducers, and parts and accessories of such articles	59
90	Optical, photographic, cinematographic, measuring, checking, precision, medical or surgical instruments and apparatus; parts and accessories thereof	32
70	Glass and glassware	23
73	Articles of iron or steel	19
29	Organic chemicals	18
39	Plastics and articles thereof	18
28	Inorganic chemicals; organic or inorganic compounds of precious metals, of rare-earth metals, of radioactive elements or of isotopes	15



40	Rubber and articles thereof	15
82	Tools, implements, cutlery, spoons and forks, of base metal; parts thereof of base metal	14
83	Miscellaneous articles of base metal	14
87	Vehicles other than railway or tramway rolling-stock, and parts and accessories thereof	13
48	Paper and paperboard; articles of paper pulp, of paper or of paperboard	12
96	Miscellaneous manufactured articles	10
94	Furniture; bedding, mattresses, mattress supports, cushions and similar stuffed furnishings; lamps and lighting fittings, not elsewhere specified or included; illuminated signs, illuminated name-plates and the like; prefabricated buildings	9

Note: Numbers of HS6 level products with identified RCAs: aggregated at chapter level.



## C.7 EU: Currently Negotiated Agreements

**Figure C.7: EU - Currently Negotiated Agreements**

Country (Region)	New agreement being negotiated	Status
Australia	Australia Agreement	Negotiations launched in 2018
China	EU-China investment agreement	Negotiations launched in 2013
Indonesia	Free Trade Agreement	Negotiations launched in 2016
New Zealand	New Zealand Agreement	Negotiations launched in 2018
Philippines	Free Trade Agreement	Negotiations launched in 2015

**Source:** European Commission, accessed June 5, 2021



## C.8 EU Agreements on Hold

Figure C.8: EU Agreements on Hold

Country (Region)	Agreement	Status
Bahrain (GCC)	Free Trade Agreement	Negotiations started in 1990, suspended since 2008
Central African Republic (Central Africa)	Economic Partnership Agreement	Negotiations started in 2003, paused until further notice in 2011
Chad (Central Africa)	Economic Partnership Agreement	Negotiations started in 2003, paused until further notice in 2011
Congo (Central Africa)	Economic Partnership Agreement	Negotiations started in 2003, paused until further notice in 2011
Djibouti (ESA)	Economic Partnership Agreement	Negotiations started in 2004, paused until further notice in 2011
Equatorial Guinea (Central Africa)	Economic Partnership Agreement	Negotiations started in 2003, paused until further notice in 2011
Ethiopia (ESA)	Economic Partnership Agreement	Negotiations started in 2004, paused until further notice in 2011
Gabon (Central Africa)	Economic Partnership Agreement	Negotiations started in 2003, paused until further notice in 2011
India	Free Trade Agreement	Negotiations started in 2007, last round in 2013
Kuwait (GCC)	Free Trade Agreement	Negotiations started in 1990, suspended since 2008
Malawi (ESA)	Economic Partnership Agreement	Negotiations started in 2004, paused until further notice in 2011
Malaysia	Free Trade Agreement	Negotiations started in 2010, paused since 2012
Myanmar	Investment protection agreement	Negotiations launched in 2015
Oman (GCC)	Free Trade Agreement	Negotiations started in 1990, suspended since 2008
Qatar (GCC)	Free Trade Agreement	Negotiations started in 1990, suspended since 2008



Republic Democratic of Congo (Central Africa)	Economic Partnership Agreement	Negotiations started in 2003, paused until further notice in 2011
São Tomé & Príncipe (Central Africa)	Economic Partnership Agreement	Negotiations started in 2003, paused until further notice in 2011
Saudi Arabia (GCC)	Free Trade Agreement	Negotiations started in 1990, suspended since 2008
Somalia (ESA)	Economic Partnership Agreement	Negotiations started in 2004, paused until further notice in 2011
Sudan (ESA)	Economic Partnership Agreement	Negotiations started in 2004, paused until further notice in 2011
Thailand	Free Trade Agreement	Negotiations started in 2013, no negotiations scheduled since 2014
United Arab Emirates (GCC)	Free Trade Agreement	Negotiations started in 1990, suspended since 2008
United States	Transatlantic Trade and Investment Partnership	Negotiations started in 2013, paused until further notice in 2016
Zambia (ESA)	Economic Partnership Agreement	Negotiations started in 2004, paused until further notice in 2011

**Source:** authors





## A.IX Input-Output Analysis: Export Sensitivity

The input-output (IO) results are based on a simple open model based on data from OECD ICIO tables (the series of tables covering years 2005-2015).

The tables presented in this paper are based on a modification of the following traditional model:

$$x_s = (I - A_R^m)^{-1}d_s$$

Where:

- $x_s$  is the complete vector of outputs of all the countries/sectors in the model
- $I$  is the unit matrix
- $A_R^m$  is a modified matrix which records modified inter-industry (intra- and interregional) flows per unit of output of each sector which includes the assumed shock to trade in the demand for intermediate products
- $d_s$  is the vector with demand shock which includes a proportional increase in the final demand (by economic agents of the analyzed country) for output from analyzed territories (the Czech Republic) or the whole EU

The model differs from the traditional simple IO modification by assuming a proportional shock not just to final demand but also to the demand for intermediate inputs. This is achieved by a modification of the  $A_R$  matrix, the sections of the columns which describe the analyzed country's demand for the output of either the Czech Republic or the EU.

The results which assumed the presence of the shocks only for the Czech Republic were extrapolated with the use of ČNB's data on territorial composition of the Czech current account during 2005-2020. The following simple specification was used for the extrapolation:

$$effect = \beta_0 + \beta_1(merchandise\ share) + \beta_2(services\ share) + u_t$$



## Association for International Affairs (AMO)

AMO is a non-governmental not-for-profit Prague-based organization founded in 1997. Its main aim is to promote research and education in the field of international relations. AMO facilitates expression and realization of ideas, thoughts, and projects in order to increase education, mutual understanding, and tolerance among people.



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An economist who works as a senior lecturer at the Institute of Economic Studies (Charles University, Prague) and researcher at CERGE-EI in Prague. He also gives lectures in selected courses at other universities (Sciences Po, Dijon). He specializes in international trade theory and trade policy, economics of transition and Chinese economy. Vilem studied at Prague University of Economics (VŠE Praha), London School of Economics & Political Science (LSE), and Charles University (IES and CERGE-EI); obtained a Ph.D. degree from the Prague University of Economics in 2003. In the past, he also worked for or collaborated with selected think tanks (IDEA, AMO, OMFIF) and participated in applied research activities (e.g. evaluation of effects of new trade agreements). Vilém was also a member of the ERAK (Economic Council of Association of Regions) in 2012. He also experienced several longer work- and research-related stays in Asian countries, specifically in China (P.R.C.) and Myanmar.



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