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NÁRODOHOSPODÁRSKA FAKULTA

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DEINDUSTRIALISATION AND ITS DRIVERS: AN INPUT-OUTPUT APPROACH

Dizertačná práca

2019 **Ing. Erika Stracová**

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Bratislava, 2019 **Ing. Erika Stracová**

Declaration of Honour

I hereby solemnly declare that this thesis represents my own work and all sources used are listed in Bibliography.

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Erika Stracová

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Abstrakt

STRACOVÁ, Erika: Deindustrializácia a jej hybné sily: prístup s využitím input-output analýzy. [Dizertačná práca]. – Ekonomická univerzita v Bratislave. Národohospodárska fakulta; Katedra hospodárskej politiky. – Školiteľ: doc. Ing. Martin Lábaj, PhD. – Bratislava: NHF EUBA, 2019. 117 s.

Priemysel predstavoval vždy jeden z dôležitých motorov ekonomického rastu. Ako je všeobecne známe, jeho výhody siahajú vysoko nad rámec priamych efektov. Je to jedno z kľúčových odvetví pre tvorbu zamestnanosti a zohráva dôležitú úlohu aj pri zamestnávaní nízkokvalifikovaných pracovných síl. Vo všeobecnosti je až jedno zo štyroch pracovných miest práve v spracovateľskom priemysle a viaže na seba ďalšie takmer dve miesta v iných odvetviach ekonomiky. Jeho významnosť tiež spočíva v ľahkej obchodovateľnosti, schopnosti prilákať investície do výskumu a vývoja a v neposlednom rade je nositeľom technologického pokroku. Priemyselné produkty predstavujú až 80% exportu z Európy a na rozdiel od ekonomiky ako celku vyniká priemysel v nepodmienenej konvergencii v produktivite práce. Krajiny so silnou priemyselnou základňou sú tiež odolnejšie voči krízam a priemysel môže slúžiť aj ako stabilizujúci politický faktor. Spracovateľský priemysel však postupne začína meniť svoj charakter a hranice medzi priemyslom a službami či inými odvetviami sa postupne strácajú a ich činnosti sú čoraz prepojenejšie. V súčasnosti si pod pojmom priemysel nemôžeme predstavovať už len samotnú výrobu, keďže ide o komplexný proces od návrhu designu, cez výrobu až po servisné a iné popredajné služby. Priemysel a služby tak môžeme v dnešnej dobe považovať za dve strany tej istej mince.

V posledných rokoch sme však svedkami prítomnosti deindustrializácie v mnohých krajinách. Tento proces môžeme charakterizovať ako klesajúci podiel pridanej hodnoty a zamestnanosti v priemysle na celkovej pridanej hodnote a zamestnanosti. Pokles možno badať nielen pri pohľade na priame štatistiky, ale aj po zohľadnení nepriamych efektov, ktoré na seba viaže v iných odvetviach. Preto sa vynára otázka, či sa význam priemyslu pre rozvoj ekonomík zmenil a do akej miery je stále dôležitý

v jednotlivých skupinách krajín. Zaujímavým je fakt, že fenomén deindustrializácie sa netýka už len rozvinutých post-industriálnych krajín, ale začína sa objavovať aj v rozvíjajúcich sa ekonomikách. Navyše k nemu dochádza pri nižšej úrovni príjmov ako v prípade pôvodných industriálnych krajín. Predčasná deindustrializácia môže byť pre tieto krajiny nebezpečná aj vzhľadom na množstvo jeho pozitívnych vlastností a výhod spomenutých v úvode (napr. kľúčová úloha pri ekonomickom rozvoji krajín, tvorbe nových pracovných miest, absorpcia investícií do výskumu a vývoja, transfer inovácií a pod.). Jeho veľmi dôležitou vlastnosťou je tiež vytváranie nepriamych efektov na produkciu, pridanú hodnotu či zamestnanosť v iných odvetviach. Len ťažko by sme našli krajinu, ktorá má v súčasnosti vysoké HDP per capita a v minulosti neprešla procesom industrializácie. Aj z tohto dôvodu môže byť predčasná strata pracovných miest a pridanej hodnoty v priemysle pre rozvíjajúce sa ekonomiky nebezpečná. Nie je vylúčené, že existuje aj iný kanál, cez ktorý sa vie krajina prepracovať do skupiny vysokopríjmových ekonomík, no pravdepodobne sa bude jednať o ťažšiu a menej jasnú cestu rozvoja.

Väčšina najvyspelejších ekonomík sveta dosiahla vrchol industrializácie už v 50. a 60. rokoch minulého storočia. Rozvinuté krajiny si prešli týmto procesom zhruba o 10 rokov neskôr, zatiaľ čo rozvíjajúce sa krajiny zaznamenali vrchol industrializácie začiatkom 90. rokov 20. storočia. Existujú však rozdiely aj v rámci jednotlivých skupín. V dizertačnej práci prezentujeme začiatok procesu deindustrializácie na vybraných ekonomikách podľa stupňa ekonomického rozvoja. Rozdielny vývoj z hľadiska pridanej hodnoty a zamestnanosti v priemysle je najviac viditeľný v rámci skupiny rozvíjajúcich sa ekonomík. Môžeme v nej nájsť krajiny, ktoré trpia už spomenutou predčasnou deindustrializáciou, ale aj ekonomiky ako Čína či India, ktoré tomuto procesu úspešne odolávajú a naopak vytvárajú nové trhy pre priemyselné produkty.

Hlavným cieľom bolo preto preskúmať dôležitosť priemyslu pre rozvoj ekonomík a zistiť, či dôsledkom deindustrializácie klesla jeho významnosť. To znamená pozrieť sa bližšie na trend deindustrializácie na národnej i globálnej úrovni, zistiť do akej miery je prítomný v rôznych krajinách, prečo k tomuto javu vôbec dochádza a aké sú jeho hybné sily. Cieľom bolo tiež overiť prítomnosť a rozsah jednotlivých faktorov, ktoré boli v literatúre charakterizované ako hnacie sily deindustrializácie. Medzi ne možno zaradiť vysokú produktivitu práce v priemysle. V súčasnosti možno vyrobiť väčšie množstvo produkcie za kratší čas s využitím menšieho množstvo pracovných síl, čo významne prispieva k znižovaniu počtu zamestnaných vo vybraných odvetviach. Medzi najviac skloňované príčiny deindustrializácie patria tiež outsourcing a offshoring. Už z definície outsourcingu vyplýva, že množstvo činností ,väčšinou priamo nesúvisiacich s hlavnou činnosťou firmy, bolo vyčlenených a alokovaných do iných firiem, najmä v oblasti služieb. Tieto činnosti sú však stále určitým spôsobom naviazané na priemysel. Vzhľadom na vysokú fragmentáciu hodnotových reťazcov bolo veľa činností vyčlenených aj za hranice domácich ekonomík a vykonávajú sa na rôznych úrovniach produkcie, a to väčšinou v krajinách s nižšou produktivitou práce.

Okrem toho zohráva v tomto procese svoju rolu aj automatizácia, dôsledkom ktorej dochádza k strate pracovných miest, ktoré sú ľahko substituovateľné robotmi. Ani tento pohľad však nie je priamočiary a po zohľadnení nepriamych efektov môžu vzniknúť úplne nové pracovné miesta, ktoré do určitej miery budú schopné kompenzovať úbytok zamestnanosti v niektorých odvetviach. Táto téma je však pomerne nová a jednotlivé predikcie sú zatiaľ ťažko overiteľné. Vo všeobecnosti sú za hybné sily deindustrializácie v literatúre považované aj globalizácia, obchod či pokles domácich výdavkov na priemysel. Posledný zo spomenutých faktorov je najviac skloňovaný v publikácii od Penedera a Streichera (2018). Podľa týchto autorov sú klesajúci domáci dopyt po priemyselných produktoch a nižší podiel domácej pridanej hodnoty v priemysle hlavnými príčinami deindustrializácie v rozvinutých ekonomikách.

Problematiku sme ďalej skúmali z globálneho hľadiska, keďže viacero autorov naznačuje odlišný pohľad na deindustrializáciu v porovnaní s národnou úrovňou. Zisťujeme, že aj vďaka koncentrácii priemyslu v malom počte (pôvodne) nízko produktívnych krajín, hlavne vo východnej Ázii, sa od roku 1970 celosvetový podiel zamestnanosti v priemysle výrazne nemenil a osciluje okolo 14%. Na posúdenie globálnej zamestnanosti v priemysle sme využili dlhší časový rad dostupný v rámci ‚GGDC 10-Sector Database' (Timmer et al., 2015).

Ako sme už v úvode naznačili, priemysel nemožno posudzovať izolovane, keďže na seba viaže množstvo činností v iných odvetviach. Veľa aktivít, ktoré pôvodne patrili pod odvetvie priemyselnej výroby teraz poskytujú firmy v oblasti služieb (napr. účtovníctvo, doprava či servis) a množstvo činností tiež zabezpečujú firmy pôsobiace v tretích krajinách. Z metodologického hľadiska je vhodným nástrojom na zachytenie týchto väzieb input-output analýza, ktorej priekopníkom bol v druhej polovici minulého storočia Leontief. Časť práce bola inšpirovaná aj autormi Montresor a Vittucci Marzetti (2010) a ich tzv. subsystémovou analýzou. Pomocou nej vieme identifikovať priame aj nepriame zapojenie rôznych aktivít v subsystémoch pre priemysel či služby. Títo autori však overovali rozsah deindustrializácie len na matici pre ‚pseudo svet', ktorý pozostával zo 7 krajín OECD a skúmali vývoj len za 80. a 90. roky minulého storočia. V dizertačnej práci sme subsystémovú analýzu aplikovali na všetky krajiny dostupné vo WIOD databáze, teda na 43 krajín za roky 2000 až 2014. Ďalej sme rozšírili analýzu outsourcingu ako potenciálnej príčiny deindustrializácie a na rozdiel od autorov Montresor a Vittucci Marzetti (2010) sme explicitne identifikovali aj offshoring, a to využitím medziregionálneho input-output modelu. V tomto smere nás inšpiroval aj výskum na tému deindustrializácie od autorov Peneder a Streicher (2018), ktorí sa na problematiku pozerali viac z globálneho hľadiska a takisto využili aj už spomínaný medziregionálny input-output model. Na rozdiel od ich publikácie sme však prítomnosť outsourcingu neposudzovali ako úplnú príčinu deindustrializácie, ale skôr ako akcelerátor pozorovanej deindustrializácie, keďže činnosti v službách a iných odvetviach nepriamo naviazané na priemysel ostávajú v domácej krajine. Na druhej strane sme venovali väčšiu pozornosť offshoringu ako potenciálnej hybnej sile poklesu dôležitosti priemyslu v najvyspelejších ekonomikách.

V neskoršej časti práce sme sa tak hlbšie venovali príčinám deindustrializácie v najrozvinutejších (G7) ekonomikách. Konkrétne sme analyzovali vplyv outsourcingu, offshoringu a zmien v globálnom konečnom dopyte po priemyselných produktoch mimo krajín G7 na postavenie spracovateľského priemyslu v krajinách G7. Za outsourcing v tomto kontexte považujeme zamestnanosť v G7 v službách a iných odvetviach mimo spracovateľského priemyslu generovanú konečným dopytom po produktoch spracovateľského priemyslu v týchto krajinách. Offshoring zas predstavuje tú časť zamestnanosti priemyselného subsystému G7, ktorá bola generovaná vo všetkých odvetviach (priemyselných aj nepriemyselných) vo zvyšku sveta konečným dopytom po produktoch spracovateľského priemyslu G7. Stratu zamestnanosti dôsledkom offshoringu aktivít súvisiacich s priemyslom môžu krajiny kompenzovať zapojením sa do priemyselných subsystémov iných regiónov (tzv. ‚forward linkages'). Je to obzvlášť dôležité v čase, kedy rapídne narastá trh pre priemyselné produkty v Číne a iných rýchlo rastúcich ázijských ekonomikách. Ani zapojenie sa priemyslu do subysystému služieb nedokázalo kompenzovať pokles zamestnanosti v priemysle vo vyspelých (G7) ekonomikách.

Za účelom identifikovania ďalších príčin v zmene zamestnanosti v spracovateľskom priemysle sme využili aj tzv. metódu štruktúrnej dekompozície, ktorá bola rozpracovaná napr. v Miller a Blair (2009), De Boer (2009) alebo Dietzenbacher a Los (1998). V našom prípade išlo o multiplikatívnu formu štruktúrnej dekompozície, v rámci ktorej sme rozložili zmenu v zamestnanosti v priemysle medzi vybranými obdobiami na príspevky niekoľkých faktorov. Skúmali sme, do akej miery ovplyvnili index rastu celkovej zamestnanosti v priemysle (priamej aj generovanej) zmeny: v produktivite práce, v štruktúre produkcie, v použití domácich medziproduktov, v štruktúre konečného dopytu v rámci priemyselnej výroby, v celkovej štruktúre konečného dopytu, v domácich výdavkoch na priemysel a v objeme celkových výdavkov. Keďže ide o multiplikatívnu formu dekompozície, prenásobením príspevkov jednotlivých faktorov získame index rastu zamestnanosti v priemysle. Analýzu sme uskutočnili vo viacerých verziách, pričom sme využili údaje v stálych aj bežných cenách.

V nasledujúcom kroku sme možné determinanty deindustrializácie určené pomocou metódy štruktúrnej dekompozície vložili do Rodrikovho modelu pre deindustrializáciu (2016) a overili ich signifikantnosť. Model sme využili aj na určenie poklesu zamestnanosti v priemysle podľa stupňa kvalifikovanosti (nízko, stredne a vysokokvalifikovaná pracovná sila). Vo finálnom kroku sme do modelu zakomponovali ako dodatočnú premennú aj údaje o použití robotov v jednotlivých krajinách (počet robotov na zamestnanosť/populáciu) a odhadovali sme tak možný efekt automatizácie na zamestnanosť v priemysle. Podobne ako v prípade dekompozície, aj pri ekonometrickom modeli sme spracovali niekoľko verzií, ktoré sa líšia použitím údajov v stálych a bežných cenách a tým pádom aj dĺžkou skúmaného časového obdobia.

Na základe použitých metód sme identifikovali rôzne príčiny a hybné sily deindustrializácie v odlišných skupinách krajín. S určitosťou však môžeme povedať, že aj napriek klesajúcim podielom pridanej hodnoty a zamestnanosti v priemysle jeho dôležitosť pre ekonomický rozvoj krajín neklesla. Na subsystémovej úrovni stále pozorujeme výrazné postavenie spracovateľského priemyslu. Pozorovaná deindustrializácia meraná ako priamy podiel zamestnanosti a pridanej hodnoty v priemysle značne podhodnocuje dôležitosť priemyslu pre domáce ekonomiky. Tá je oveľa vyššia, ak berieme do úvahy aj outsourcing ekonomických činností mimo priamej priemyselnej výroby. Síce sa jedná o činnosti, ktoré nie sú priamo zaradené v štatistikách v kategórii spracovateľský priemysel, no sú naň naviazané a bez jeho úspešného fungovania by tieto pozície nemuseli vzniknúť. Dôležitým faktom je, že generovaná zamestnanosť aj pridaná hodnota tak naďalej ostávajú v domácej ekonomike. Outsourcing teda možno považovať len za hnaciu silu tzv. pozorovanej deindustrializácie. Zároveň zisťujeme, že rozvinuté krajiny dosiahli vrchol outsourcingu takmer pred dvomi desaťročiami a hnaciu silu deindustrializačných procesov v týchto krajinách predstavuje offshoring. Ten viedol k presunu produkcie a zamestnanosti z rozvinutých ekonomík do Číny a ďalších rýchlo rozvíjajúcich sa krajín, napr. do Indie, Indonézie, Kórey, Turecka, Poľska či Thajska. Konštatujeme teda, že zatiaľ čo outsourcing a globalizáciu možno považovať za hlavné príčiny deindustrializácie v rozvíjajúcich sa ekonomikách, v rozvinutých krajinách zohráva väčšiu rolu offshoring a zvýšená produktivita práce.

Použitím metódy štruktúrnej dekompozície sme ďalej identifikovali aj menej výrazné hnacie sily tohto procesu. Na základe všetkých verzií dekompozície sme charakterizovali ako ďalšie hnacie sily deindustrializácie nasledovné: zvýšená produktivita práce, menší podiel domácich výdavkov na spracovateľský priemysel, nižšie využitie domácich medziproduktov a zmeny v štruktúre konečného dopytu. Aj keď pozorujeme pokles priemyslu v ukazovateľoch pridanej hodnoty a zamestnanosti, nemožno povedať, že by jeho dôležitosť pre rozvoj ekonomík klesala. Stále je množstvo činností, ktoré priamo alebo nepriamo závisia od spracovateľského priemyslu a jeho úloha pri ekonomickom rozvoji krajín je stále významná. Dôkazom je aj podiel pridanej hodnoty v službách generovaný dopytom po priemyselných produktoch, ktorý je najvyšší práve v rozvíjajúcich sa ekonomikách. Aj preto badať úsilie o vytvorenie nových priemyselných politík, najmä v kontexte Európskej únie. Svedčí o tom aj snaha Európskej komisie o vytvorenie nového postu komisára pre priemysel. Vznik novej priemyselnej politiky podporuje najmä Nemecko, Francúzsko, ale aj európsky súkromný sektor vrátane Slovenska. Prioritou je obstáť v konkurenčnom boji s rozširujúcim sa priemyselným trhom vo východnej Ázii, najmä v Číne a Južnej Kórey. V rámci našej analýzy sme však identifikovali len slabé zapojenie sa krajín G7 na týchto trhoch, čo môže byť príčinou poklesu relatívnej dôležitosti priemyslu v týchto ekonomikách.

Na základe nášho výskumu je možné formulovať i nové výskumné otázky. V budúcnosti by bolo ideálne využiť údaje v stálych cenách aj za nové obdobie, ak budú k dispozícii, a očistiť tak výsledky o zmeny relatívnych cien. Takisto by bolo vhodné overiť naše tvrdenia aj využitím iných input-output databáz, napr. OECD TiVA (Trade in Value-Added) databázy alebo multiregionálnej input-output databázy EORA. Ich výhodou je tiež pokrytie väčšieho množstvo krajín, čo umožňuje do väčšej hĺbky preskúmať aj proces predčasnej deindustrializácie. Tá sa týka najmä chudobných Sub-Saharských krajín, Latinskej Ameriky či viacerých chudobnejších regiónov Ázie. V týchto krajinách totiž dochádza k deindustrializácii skôr než stihli prejsť procesom úplnej industrializácie, čo pre ne môže predstavovať hrozbu. Aj na základe nášho výskumu vieme, že priemysel je stále dôležitou súčasťou ekonomiky a nemožno sa orientovať len na služby, keďže tie musia byť v prvom rade naviazané na dobre fungujúci priemysel. Deindustrializácia v týchto krajinách tak môže byť alarmujúcejšia než v prípade najvyspelejších ekonomík sveta. Priestor na nový výskum sa otvára aj pri téme automatizácie. Ide o pomerne novú oblasť, ktorej dopady na zamestnanosť zatiaľ nie sú úplne jasné a v súčasnosti sú ťažko overiteľné. S určitosťou však vieme povedať, že pozícia priemyslu vo svetovej ekonomike ostáva naďalej dôležitá.

Kľúčové slová: spracovateľský priemysel, deindustrializácia, zamestnanosť, input-output analýza, štruktúrna dekompozícia.

Abstract

STRACOVÁ, Erika: Deindustrialisation and Its Drivers: An Input-Output Approach. [Dissertation thesis]. – University of Economics in Bratislava. Faculty of National Economy; Department of Economic Policy. – Thesis supervisor: doc. Ing. Martin Lábaj, PhD. - Bratislava: FNE EU, 2019, 117 p.

In recent years, deindustrialisation has been documented in many economies on national levels. This trend is characterised by the decreasing share of value added and employment in manufacturing on their total values. What is intriguing is that this phenomenon goes far beyond the advanced post-industrial countries. Since manufacturing is well recognised as a key industry for the economic development, job creation, its ability to attract investments and transfer innovation, premature deindustrialisation could be harmful for developing economies. Moreover, the major importance of manufacturing lies in its indirect effects generated in other industries as well. Most of the advanced economies reached their peak in industrialisation in the 1960s or the 1970s, while the developing world started to deindustrialise in the early 1990s, but at lower levels of income compared to early industrialisers. Therefore, the main aim was to examine the current trend of the so-called deindustrialisation and find out for which countries it is relevant, to what extent it is present, why it is happening in the first place and what drives this process. Next, there is an indication that approaching this phenomenon from the global perspective might reveal different results. We find out that due to the concentration of manufacturing activities in a fewer number of former lower productivity economies, particularly in East Asia, the global manufacturing employment share remains stable since 1970. Definitely, we cannot say that the importance of manufacturing for the world economy has declined in recent years. Even though deindustrialisation is present in many countries, we can observe a strong integration of manufacturing on the subsystem level. We revealed that the observed deindustrialisation measured by the direct employment and value added shares of manufacturing underestimates the importance of manufacturing for domestic economies since it is much higher once we account for an outsourcing of economic activities outside the direct manufacturing production. At the same time, we observe that the peak of outsourcing levels in major developed countries was met almost two decades ago and it was the offshoring that led to a shift of production and employment from developed economies to China and other Risers. Thus, while outsourcing and globalisation play a major role in deindustrialisation in developing economies, offshoring and productivity improvements are to blame in major developed and developed economies. Using the structural decomposition analysis, we also identified some of the less pronounced drivers of this process. Based on all versions of decomposition analyses, the factors contributing to overall manufacturing employment changes are mostly an increasing productivity of labour, a lower share of domestic expenditures for manufacturing, lower use of domestic intermediates or changes in the final demand structure. To conclude, even though we witness a decline in manufacturing in terms of output and employment, we show that the importance of manufacturing for the world economy has not declined. There are still many activities that depend directly or indirectly on manufacturing and its importance for economic development is still strong. This is also reflected in the calls for new industrial policies, mostly in the context of the European Union.

Key words: manufacturing, deindustrialisation, employment, input-output analysis, structural decomposition analysis.

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List of Abbreviations

ABBREVIATION The meaning

DT Deindustrialisation/Tertiarization

EC European Commission

EU European Union

GGDC Groningen Growth and Development Centre

GDP Gross Domestic Product

ICT Information and Communications Technology

IFR International Federation of Robotics

IO Input-output

OECD Organisation for Economic Co-operation and Development

pp percentage point

RoW Rest of the World

R&D Research and Development

SMEs Small and Medium-sized Enterprises

UNIDO United Nations Industrial Development Organization

VA Value added

WB World Bank

WIOD World Input-output Database

WIOD13 World Input-output Database 2013 Release

WIOD16 World Input-output Database 2016 Release

WIOT World Input-output Tables

Introduction

In general, manufacturing has also been considered as engine of growth. It has major effect on employment and it is considered to be one of the key sectors for job creation which has also traditionally absorbed significant quantities of unskilled labour in contrast to other high-productivity sectors. Moreover, its importance is further increased by its ability to attract R&D investments. Another advantage of manufacturing is its tradability and unlike whole economies, manufacturing industries exhibit a strong unconditional convergence in labour productivity. In addition, industry is strongly resilient to crises, i.e. countries with a strong industrial base are able to recover from the financial and economic crisis better and more quickly compared to other countries.

However, in recent years, there has been clear evidence for the presence of deindustrialisation in many countries. Thus, also the European Commission calls for an 'industrial renaissance' and believes that building a strong industrial base will lead to a revival of the European economy and to a strengthening of its competitiveness. This has been frequently highlighted in the communications of European Commission dealing with industry. Even in 2012, the Commission introduced an ambitious target of achieving a 20% share of manufacturing on GDP by 2020.

Further, what is interesting is that deindustrialisation has not only been an issue for advanced economies, but it is becoming a hot topic in the developing world as well. Even more intriguing is the fact that in developing countries, this has been happening at an even faster pace and at much lower levels of income and productivity compared to the early industrialisers. This implies that developing countries are running out of industrialisation opportunities way too soon, which means that they experience premature deindustrialisation. This could be harmful for developing nations, since manufacturing has been considered an important driver of growth for many years.

There are many theories trying to explain the decline in manufacturing output and employment in recent decades. The productivity-based theory can be considered the most common. It says that with the rise in productivity, fewer workers are needed to produce a higher volume of manufacturing goods. Other drivers intensifying the deindustrialisation processes may include commercialisation of services for households, increasing importance of educational services, and growing outsourcing of services by manufacturing companies. Moreover, globalisation and offshoring are responsible for the shift of some manufacturing activities from their countries of origin and thus also for the deindustrialisation in many countries.

However, it is necessary to be careful when explaining the reasons why some countries have been going through the deindustrialisation process. The story for the emerging and the advanced economies is not the same. It seems that productivity improvements and offshoring have played a major role in advanced economies, while globalisation and outsourcing may be to blame in the developing world. Overall, deindustrialisation is stronger in terms of employment rather than output, which is definitely true for the advanced world economies. In many cases, increasing automation of some manufacturing activities is held responsible for the employment deindustrialisation as well. The computer revolution certainly increased the demand for cognitive skills while reducing the demand for workers performing routine jobs. In addition, due to a rapid growth of new technologies and the automation of manufacturing jobs, many workers may be reallocated to technologically stagnant sectors of the economy or entirely new service industries. This all implies that manufacturing jobs as we know them will not come back or at least not in the desired amount.

Moreover, a concentration of manufacturing activities in a few lower productivity countries, particularly in East Asia, has been occurring since the 1990s. China and the so-called risers (Korea, India, Indonesia, Thailand, Turkey and Poland) increased their global manufacturing shares at the expense of G7 countries. This has definitely had implications for the growth prospects of both developed and other developing countries and it is undeniable that the importance of manufacturing for economic development is still strong. Thus, from a global perspective, the share of employment and output in manufacturing has not declined significantly compared to 1970.

Since we have been witnessing these major structural changes in recent decades, some adjustments in policy making are inevitable. Future industrial policy is likely to become focused on innovation (creation, design, and marketing of attractive bundles of products and services) across all industries, not only in manufacturing. Furthermore, a more globalised world will require much greater investments in education, infrastructure and social safety nets. This all represents a big challenge for the democracies of today.

This dissertation is divided into four chapters. The first chapter deals with the beginning and causes of deindustrialisation and the development of this process throughout the years. It contains a literature overview covering all important sources dealing with the topic. Different kinds of deindustrialisation measures are included as well. The second chapter summarises the aim and the main hypotheses to be analysed in the dissertation. The subsequent chapter contains the methodology of the subsystem analysis and the structural decomposition analysis. Description of the deindustrialisation model and the data used can be found in this chapter as well.

Finally, chapter four contains results of the empirical analysis. It covers the beginning of deindustrialisation in different country groups, as well as the global perspective of the process, which approaches the issue from a slightly different angle. Analysis is performed for value added and employment. Subsequently, a structural decomposition analysis is provided in two versions, i.e. based on data in both constant and current prices. Lastly, potential drivers of deindustrialisation are included in a regression model proposed by Rodrik (2016). To examine the effects of automation, data on robots in individual countries have been included in the model, too.

1 Literature Review

1.1 Introducing deindustrialisation

In general, manufacturing has a major effect on employment, and it is considered to be one of the key sectors for job creation. On average, one in four jobs is created in industry and it generates one half to two jobs in other industries. Moreover, its importance is further increased by its ability to attract R&D investments. In Europe, for example, close to two-thirds of business R&D spending is done in manufacturing. Another advantage of manufacturing is its tradability, which is documented by industrial products accounting for about 80% of the exports from Europe. In addition, unlike whole economies, manufacturing industries exhibit a strong unconditional convergence in labour productivity. It means that industries starting farther away from the labour productivity frontier experience significantly faster productivity growth irrespective of institutional quality, domestic policies, geography or other country-specific features. Convergence as such ensures that the relevant sector behaves as the so-called escalator that leads to higher levels of sectoral and thus economy-wide productivity (Rodrik, 2013; European Commission, 2014; Amirapu and Subramanian, 2015).

Furthermore, manufacturing has traditionally absorbed significant quantities of unskilled labour in contrast with other high-productivity sectors. Last but not least, industry is strongly resilient to crises. The history has shown that countries with strong industrial base (e.g. Germany) have been able to recover from the financial and economic crisis better and more quickly than other countries. Thus, also the European Commission (2014) calls for 'industrial renaissance' and believes that building a strong industrial base will lead to a revival of European economy and to a strengthening of its competitiveness. The issue has been frequently discussed since the Europe 2020 Agenda (A European strategy for smart, sustainable and inclusive growth) where the importance of manufacturing industry for the smart, sustainable and inclusive growth was highlighted (European Commission, 2010). It has also been a subject of the most recent communication called For a European Industrial Renaissance. Even before, in 2012, the Commission introduced an ambitious target of achieving a 20% share of manufacturing in GDP by 2020 (European Commission, 2012). Taken together, these characteristics make manufacturing an important and irreplaceable source of growth for developing economies and an early deindustrialisation could be harmful for them. For all these reasons, many national governments have targeted manufacturing in their development plans (Rodrik, 2013; Rodrik, 2016).

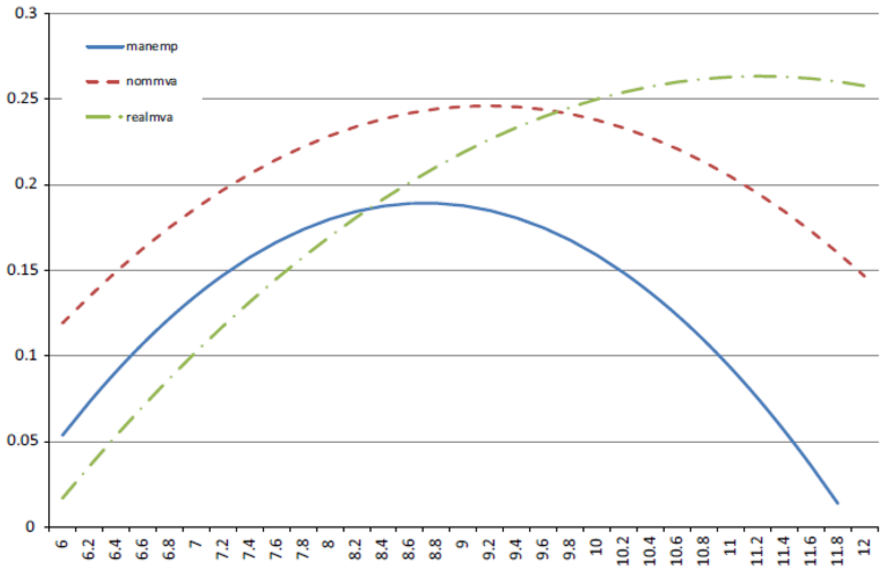
One of the first to identify the importance of industrialisation for the development of a country was Kaldor and it still holds that manufacturing is the engine of growth (Kaldor, 1966; Kaldor, 1967). This was confirmed also empirically by Szirmai (2012) and Szirmai and Verspagen (2015). Szirmai (2012) thoroughly explained why industrialisation has been an engine of growth in economic development for many years. Moreover, they added that it is mostly true for developing countries, but even there, the extent to which it applies has been decreasing since the 1990s. Some of the arguments are the following: (i) there is an empirical correlation between the degree of industrialisation and per capita income, (ii) productivity is higher in manufacturing than in agriculture, (iii) compared to the agricultural sector, the manufacturing sector offers special opportunities for capital accumulation, (iv) for economies of scale and (v) for both embodied and disembodied technological progress. Moreover, (vi) linkage and spillover effects are much stronger here than in other sectors and so forth. The author concludes that there is no example of a country with a success in economic development that would not have been driven by industrialisation.Felipe and Mehta (2016) were discussing the topic further. They were explicitly asking whether today's developing economies can achieve a high-income status without going through an industrialisation process. They found that practically every high-income country experienced a manufacturing employment share over 18 to 20% since the 1970s. Achieving this boundary has been absolutely necessary for achieving high-income status. However, as mentioned before, high manufacturing employment shares are becoming more difficult to sustain as income rises, which suggests that the path to growth through industrialisation becomes more difficult.

However, nowadays, the term industry does not only include production. The whole process starts with raw materials and energy and ends with business and consumer services and tourism. During the Forum Europe conference about re-industrialisation, Biénkowska (2015), European Commissioner for Internal Market, Industry, Entrepreneurship and SMEs, emphasised that manufacturing and services have to be viewed as two sides of the same coin. In a modern economy, there is no choice between one or the other option. These two sectors are becoming more intertwined, as evidenced by the fact that 40% of jobs in the European manufacturing are linked to services. In other words, outsourcing and continuous fragmentation of global value chains decrease the relevance of direct employment and value-added effects of manufacturing for overall economic performance. Many activities, once part of manufacturing, are now supplied by businesses in the service sector and many high value-added activities are being outsourced to companies outside the manufacturing industry. Also, Baldwin (2017) and Ciriaci and Palma (2016) argue that the distinction between manufacturing and services is becoming blurred and services and industry are now in fact one and the same thing. More manufacturing firms are engaged in service activities and more wholesale firms are engaged in manufacturing. One can talk about the factory-free economy, as well. Thus, the question about the real magnitude of the so-called deindustrialisation arises.

Also, many authors dealing with the topic of industry identify deindustrialisation as a crucial issue in this field. In general, deindustrialisation can be described as a process of a decreasing relative importance of manufacturing. According to Baldwin (2017), it is happening in all the industrial countries. Specifically, there has been a major decline in the share of manufacturing on both employment and value added on the national level. The authors of the mid-20th century, such as Clark (1940), Rostow (1960) or Kuznets (1966) considered the transition from industry to services as a natural and inevitable process due to rising productivity in manufacturing. Clark (1940) was one of the first to define the so-called deindustrialisation. Since then, it has been regarded as a general tendency in economic development, moreover strictly connected to tertiarization, i.e. the increased share of services sector (Montresor and Vittucci Marzetti, 2010). Also, according to Rodrik (2016), the shift of some manufacturing activities towards services has caused a decline of the manufacturing sector. However, although the weight of market services in the manufacturing subsystem increases, even subsystem shares (direct plus indirect) decrease significantly, which means that the actual extent of the deindustrialisation hypothesis is quite large. As shown by Berger and Frey (2016), manufacturing employment has declined by some 30 percent since 1980, particularly in low-technology sectors. Similarly, the United States experienced a steep decline in manufacturing, from about 28 to 16 percent of its total workforce, between the mid-1960s and 1994. The EU15 followed a similar trajectory with its manufacturing employment falling from around 30 percent in 1970 to 20 percent in 1994. In 2011, the manufacturing share in value added was merely 16% in the EU and 13% in the US. In some countries, like Japan, deindustrialisation was not so dramatic, but still present (Rowthorn and Ramaswamy, 1997).

What is even more intriguing is the fact that deindustrialisation is not only a phenomenon of the developed economies, but this trend is observable in the developing countries as well. Moreover, this has been happening there at an even faster pace. This implies that these economies are running out of industrialization opportunities sooner than today's developed countries. Moreover, this could lead to a change in the process of creating modern states and democratic policies, as historically documented in the case of Western Europe and North America. These trends have been pointed out by many authors, for instance Rodrik (2016), Bernard et al. (2017) or even earlier by Dasgupta and Singh (2006). On top of that, Kaldor (1966) used this reference much earlier when he talked about the early deindustrialisation in the context of the United Kingdom. A special term for this paradox was developed and it is called premature deindustrialisation.A special term for this paradox was developed and it is called premature deindustrialisation. The other reason of why it is called premature is that in most of the developing countries, manufacturing has begun to shrink at much lower levels of income compared to the early industrialisers. Based on empirical findings, some authors, e.g. Rowthorn and Wells (1987) contrasted the negative undertone of the term deindustrialisation with the so-called ‘positive deindustrialisation’. According to them, we witness it when the productivity growth in the manufacturing industry is so strong that increasing output is accompanied by the reduction of employment in this sector (either absolutely or relatively). However, we cannot say that it leads to unemployment since new jobs are created in the service industry which sufficiently absorbs displaced manufacturing workers. The authors claim that ‘negative deindustrialisation’ can hit economies at any stages of their development, also in a state which was described e.g. by Dasgupta and Singh (2006) and Rodrik (2016) as premature, i.e. before reaching the full industrialisation and correspondingly high levels of income. In addition, also the positive deindustrialisation can occur prematurely, usually when it is driven by other industries than manufacturing, e.g. knowledge-intensive business services. The negative and positive connotation and socio-economic consequences of this term are also discussed in White (1996) where they are subsumed as simply ‘deindustrialisation’.

Figure 1.1: Simulated manufacturing shares as a function of income (In GDP per capita in 1990 international dollars)

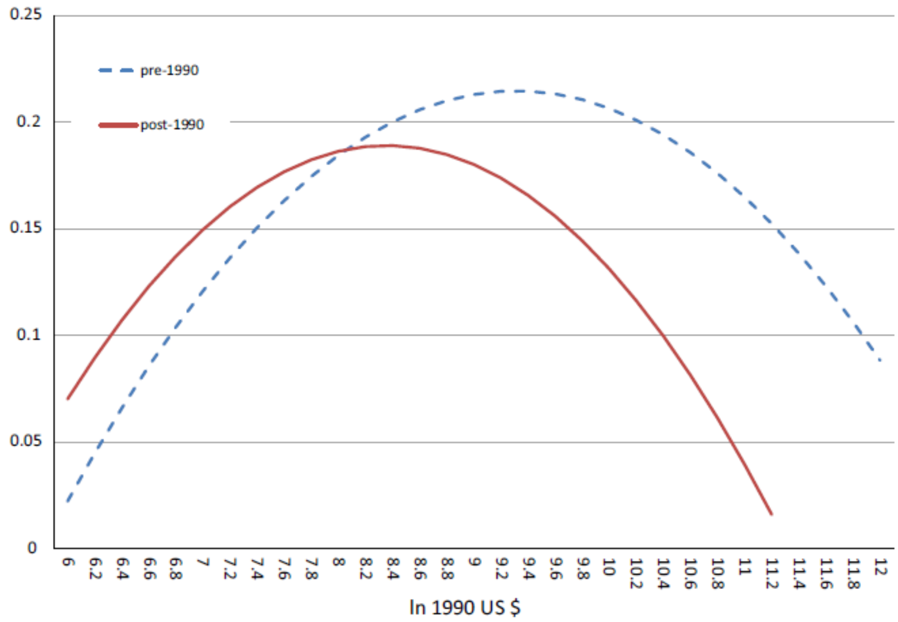


Source: Rodrik, 2016.

In the following lines, we take a closer look at deindustrialisation at different development stages. As can be seen in Figure 1.1 by Rodrik (2016), the share of manufacturing for a 'representative' country first tends to rise and then fall as the country is developing. However, there is a significant difference in the turning points. In particular, manufacturing employment (manemp) peaks much earlier compared to the real manufacturing value added (realmva), which peaks very late in the development process. For instance, industrialization in Western European countries such as the UK, Sweden or Italy peaked at income levels of around USD 14,000 (in 1990 dollars), while in India or many Sub-Saharan African countries, manufacturing appeared to have reached its peak at income levels of only USD 700. When it comes to Latin America, industrialisation is quite a recent development (the second half of the 20th century), however, manufacturing already reached its peak in most of the Latin American countries as well. This is true for both employment and value added. For instance, the four countries representing a significant share of Latin America's GDP (Chile, Brazil, Argentina and Mexico) reached their manufacturing peak at a level of GDP per capita only between USD 4,000 to USD 7,000 (Castillo and Neto, 2016). In general, most of the authors agree that the turning point for the group of developed countries was between USD 10,000 to USD 15,000 per capita and most of the OECD countries reached this by 1970 (Rowthorn and Ramaswamy, 1999; Castillo and Neto, 2016).

This has also been documented by Amirapu and Subramanian (2015). They claim that the relationship between employment share in industry and GDP per capita has been changing dramatically over time. First, at any given stage of development, countries are typically specialising less in manufacturing and simultaneously devoting fewer labour resources to it. Second, the point of time at which industry peaks and deindustrialisation begins is happening earlier in the development process (also shown in Figure 1.2 by Rodrik). This pattern has been also confirmed by Felipe et al. (2018) who show that this downward trend holds whether taking manufacturing shares in terms of employment or output. They also document that the trend is stronger for employment shares. This implies that developing countries are not able to build as large manufacturing sectors and are turning into service economies without having gone through a proper industrialisation.

Figure 1.2: Simulated manufacturing employment shares



Source: Rodrik, 2016.

The aforementioned authors also examined whether today's developing economies can achieve the status of a high-income country without first building large manufacturing sectors. They found that practically every economy that enjoys a high-income status today experienced quite large manufacturing employment shares exceeding 18% to 20% sometime since the 1970s. However, in the case of developing nations, the peak employment share has fallen to around 13% to 15% at income per capita levels of only USD 8,000 to 9,000. High manufacturing employment shares are becoming more difficult to sustain, which suggests that the path to prosperity through industrialisation may have become more challenging. Most recently, this has also been identified by Italian authors Romano and Trau (2017), who discussed the relationship between industrial development and structural change in the area of globalisation. They concluded that intra- and inter-sectoral adjustments have been significantly faster for late industrialisers as compared to those who built their manufacturing base in earlier times.

1.2 Causes of deindustrialisation

There are many theories explaining the decline in manufacturing employment in recent years. The productivity-based theory can be considered the most common one, i.e. with the rise in productivity; fewer workers are needed to produce a higher volume of manufacturing goods. Matsuyama (2009) significantly contributed to this by his simple model of the world economy, in which productivity gains in manufacturing are responsible for the global trend of manufacturing decline. However, in a cross-section of countries, faster productivity gains in manufacturing do not have to necessarily imply faster declines in manufacturing. What is important here is the interdependence among countries, which does not allow us to test a closed economy model to explain cross-country variations of manufacturing employment shares. If we are interested in explaining cross-country variations, we need to adopt a global perspective – a model of the world economy without the false assumption that each country in the data was in autarky. The whole evidence is precisely described in his article from 2008.

Furthermore, many other reasons of why some countries have been experiencing a decrease in their manufacturing have been introduced by various authors. According to Mucha-Leszko et al. (2016), some of the drivers intensifying the deindustrialisation processes are the commercialisation of services for households, the increasing importance of educational services and the growing service outsourcing by manufacturing companies. First, the commercialisation of services for households is represented by more intense linkages between traditional manufacturing products and new modern services (e.g. the tracking of some products after they are sold by a producer to a customer). Second, the importance of a highly-skilled and qualified labour force for manufacturing is constantly increasing. Most importantly, a major growth of services outsourced by manufacturing companies has been observed. This process can be characterised by redrawing boundaries between existing industries (Jacobides and Winter, 2005).

However, we have to be careful when explaining the reasons why some countries have been going through a deindustrialisation process. The story is not the same for the emerging economies as for the advanced ones. It seems that productivity improvements have played a major role in the advanced economies, while globalisation is considered to be the culprit in the developing world. Typically, manufacturing experiences more rapid productivity growth as compared to the rest of the economy. Therefore, the share of the economy's labour employed by manufacturing decreases. However, under the same assumptions, the output share of manufacturing moves in the opposite direction, i.e. it increases. This results in the employment rather than output deindustrialisation, which holds for the advanced world economies. For developing countries, on the other hand, it is less evident that technological progress applies in quite the same way, since they experience a strong reduction of not only employment but also output. The possible explanation for this could be found in trade and globalisation. It is mostly true for countries without a strong comparative advantage in manufacturing which became net importers of manufacturing and also deindustrialisation from advanced countries. One can call it 'imported' deindustrialisation since developing economies are exposed to the relative price trends originating from the advanced countries (Rodrik, 2016).

According to Peneder and Streicher (2018), within the highly developed economies, deindustrialisation is mainly driven by the declining share of manufacturing on domestic final demand expenditures. In contrast, in some individual countries like Taiwan and South Korea, the positive net trade effect can outweigh the decline in domestic expenditures for manufacturing and cause its value added share to grow. Similarly, China and some Central and Eastern European countries prove the point that the net trade channel, i.e. comparative advantage, can make a difference in structural change and deindustrialisation. The picture is somewhat mixed for other developing nations. Some of them experienced a decline in the comparative advantage of their manufacturing products, some of them an improvement, however, neither could stop the deindustrialisation process, which was driven to a higher extent by the declining share of manufacturing on domestic final expenditures. They also point to the „paradox "of industrial policy, which says that when it successfully raises competitiveness and hence improves productivity growth of manufacturing, it also furthers the global decline of relative prices in manufacturing. This implies that if national policies are successful in reindustrialisation, they simultaneously accelerate deindustrialisation in the global economy. Moreover, the authors suggest that policies should target for example productivity growth in services in order to raise the income share of manufacturing (Peneder and Streicher, 2017).

In many cases, increasing automation of some manufacturing activities is held responsible for the employment deindustrialisation. However, according to The Economist and Dani Rodrik (2017) from Harvard University, this does not have to be true for many workers in the developing world. For instance, in Latin America, the arch of industrialisation has lost its height and reach but there are no more robots there than in the rest of the countries. Another example can be that regulatory barriers (e. g. high import duties) are far more damaging for South Asia's garment-makers than automation. Indeed, the practical people managing the supply chains for clothing retailers are quite sceptical about the role of robots in the industry and full automation. On one hand, automation can speed things up, but on the other hand, it also adds to costs. The story holds for many boot or clothes factories in the developing nations, where only 20% to 25% of production processes is predicted to be automated. Also, the authors from UNIDO[1] (Haraguchi et al., 2017) argue that manufacturing employment became geographically more concentrated (in a small number of mainly large developing countries) after 1990, but no less important. They found that the average of each country's manufacturing-employment ratio has indeed declined since the early 1990s, as Rodrik (2016) showed. But when they looked at manufacturing aggregate share in developing countries, whether in terms of value added or employment, the share has not declined since 1990, and maybe even increased. It holds true because of the inclusion of large economies like China or other Asian countries that have managed to defy premature deindustrialisation so far. The same, in aggregate, is true for Sub-Saharan Africa. To conclude, the decline in both manufacturing value added and employment shares in many developing countries has not been caused by changes in the manufacturing sector's development potential, but it has been due to a strong concentration of manufacturing activities in a small number of developing economies.

[1] United Nations Industrial Development Organisation

This is consistent with Baldwin (2016), according to whom, China and '6 risers' (Korea, India, Indonesia, Thailand, Turkey and Poland) increased their world manufacturing shares at the expense of G7 countries. These results are further supported by Felipe and Mehta (2016), who found that when looking at the global picture, manufacturing share of employment and output did not decline between 1970 and 2010. In fact, the global manufacturing employment share has been near constant over time – roughly 14% of global employment. While Europe and North America lost some manufacturing jobs, they have been almost proportionally gained in China and South Asia. An analogous story applies to value added shares. The constancy of both the global manufacturing employment and value added suggests that global labour productivity (measured as value added per worker) in manufacturing has not grown faster than the global productivity in aggregate. This is contradictory to within-country trends reported by many studies, in which labour productivity in manufacturing grew much faster than aggregate labour productivity.

Even if the manufacturing productivity does not deviate much from the aggregate one, the changes in manufacturing (e.g. the reconfiguration of supply chains or the character of manufacturing jobs) are happening at a fast pace. Among many changes, automation is one of the most striking. It is present in all sectors of the economy, but much more in manufacturing than in services. Convincing manufacturing companies to keep or bring back some jobs is not possible, since millions of jobs have been lost due to technological change. The better solution would be to reorient educational institutions and job training around human skills which cannot be so easily automated. These skills include mainly creativity and complex problem-solving and belong to those with relatively high pay and benefits (Deming, 2017). This implies the shift from industrial economies to service ones and the need to invest in new infrastructure and education to prepare new generations for their changing roles (Fontagné and Harrison, 2017). Moreover, a structural transformation towards a factory-free economy has been happening in industrial countries for many decades. Therefore, Bernard and Fort (2017) shifted the focus from manufacturing to factory-less goods producers (FGPs for short), defined as 'manufacturing-like' in the sense that they might be a result of a production process and delivery but do not actually engage in the production themselves (e.g. companies which design and sell innovative appliances but no longer manufacture them themselves). According to the above-mentioned authors, so far there exists little evidence about these enterprises. If FGPs were reclassified to manufacturing, they estimated that the number of manufacturing employees in the United States in 2007 would increase by a minimum of 3 to a maximum of 14 per cent. In this case, we can talk about 'hidden deindustrialisation'. Also, according to The Economist (2017), some official statistics tend to exaggerate the loss of jobs in manufacturing. In the past, some jobs that would not count as manufacturing today were considered as such, while some jobs that seem obviously part of manufacturing today are not counted as such, reducing the total manufacturing employment.

Furthermore, factory-less jobs and the changing character of the working class will have a large impact mainly on the labour market. Deindustrialisation changes the structure of jobs towards more dispersed service workplaces in which atypical work is more common (Tregenna, 2014). The changing composition of the workforce is also discussed to a larger extent in the OECD document by Berger and Frey (2016). They confirm that in recent years, the scope of automation has expanded considerably. The computer revolution certainly increased the demand for cognitive skills and on the other hand reduced the demand for workers performing routine jobs. In addition, due to a rapid growth of new technologies and the automation of manufacturing jobs, many workers will be reallocated to technologically stagnant sectors of the economy, including health care, finance, government and social and personal services or entirely new service industries such as video and audio streaming or web design. However, there is evidence that digital technologies have not created many new jobs to replace the old ones. Recent job growth among OECD countries has originated in non-technology sectors. Indeed, majority of the employment growth in the United States has taken place in sectors producing non-tradable outputs, i.e. government service or health care, with significant contributions also from accommodation, food and retail industry. Moreover, job creation in the tradable sector is highly concentrated to skilled sectors such as engineering, finance and computer design, while job losses were concentrated in less skill-intensive jobs in the automotive industry and agriculture. Besides, Graetz and Michaels (2015) show that tasks involving communication and interpersonal activities have become more prominent across occupations, as well as geographically concentrated to larger metropolitan areas. Nowadays, work in urban areas revolves around tasks that require workers to 'analyse', 'advise' and 'report'. This is all possible due to improvements in communications infrastructure which significantly increased the interactivity of jobs. Later in the work, Graetz and Michaels (2015) analyse the economic impact of industrial robots, using new data on a panel of industries in 17 developed countries (1993–2007). Their findings suggest that industrial robots increased both labour productivity and value added and hence the average growth rates of countries. According to the authors, robots increased both wages and total factor productivity and reduced the hours worked by low-skilled and middle-skilled workers. Nevertheless, they warn that the rise of robots is not good for everyone, i.e. low-skilled and middle-skilled workers in particular may lose out.

Most recently, research regarding this topic was performed by Prettner et al. (2018). Their main aim was to analyse the role of offshoring and reshoring in the context of automation. They found that automation replaces more and more jobs in the manufacturing production, which supports relocation of manufacturing from a low-wage country back to a high-wage country, i.e. reshoring. This process, however, does not imply significant job creation. They show the Adidas factory, a formerly German sportswear manufacturer, as an example, when production has been relocated from China, Indonesia and Vietnam back to Germany and the United States. Most of the tasks are now being performed by automated processes, robots and 3D printers. Out of more than 1,000 jobs, only about 160 are performed by humans. Most of the tasks are concerned with maintaining the robots and activities which cannot be done automatically yet, like putting laces into the shoes. The authors also examined the time when reshoring begins, how it influences wages and finally, inequality. Accumulation of physical capital in the poorer country leads to rising wages and therefore discourages domestic firms from offshoring their production abroad. This is the stage, when reshoring starts and firms move back to their home countries, so clearly, we can see a Ushaped relationship between economic development and offshoring. However, reshoring does not generate new jobs or raise wages of the low-skilled workforce. In contrast, wages of high-skilled workers, who can be considered as complements to automated processes, increase. Using mainly the WIOD and the International Federation of Robotics data, Prettner et al. (2018) also calculated that, on average, an increase of robots by one unit per 1,000 of workers causes a 3.5% increase of the reshoring activity. We can summarise that reshoring is positively associated with an increase in the high-skilled labour but not in the low-skilled labour, which may imply an increase in inequality. Thus, the additional funds should be provided for education and thus ensure that people acquire skills that are complementary to automation technologies. However, considering current educational and trade policies in many countries, this is not likely to happen soon.

Moreover, Imbs (2017) examines the trends within both manufacturing and services, i.e. whether the deindustrialisation is driven to a larger extent by low-, medium- or high-tech industries. He found out that while light industries fell substantially, the share of heavy industries (e.g. metals, metal products, machinery, equipment and transport equipment) increased as the share of value added. In services, the jobs were added to administrative services in the first place. In terms of output gains, employment, value added, and productivity growth all increased in the ICT sector. However, in the latest years of his sample, both labour and output shares decreased simultaneously in heavy manufacturing. This is also consistent with the findings of the authors mentioned above.

Finally, globalisation and offshoring are also responsible for the shift of some manufacturing activities from their countries of origin and also for the deindustrialisation in many countries. According to Baldwin (2017), the ICT revolution changed a lot. High-tech firms found it profitable to combine their specific know-how with lower wages in developing nations. This enabled the shift of many manufacturing activities from 'North' to 'South'. While some manufacturing jobs will remain at home, they will more likely be the high skill-intensive jobs. Value added may remain in industrial countries, as well, however, it is unlikely that this will bring more factory jobs. Ebenstein et al.

(2017) also contributed to this topic. For instance, they examined the labour force participation in the US, which suffered from high rates of unemployment after the global financial crisis. However, their results indicate that offshoring to China or elsewhere played a very small role. The most important factors associated with the reduction of labour force participation in the United States were computer use rates or increasing capital intensity. Kramarz (2017) also focuses on the cost to the labour market as a consequence of increasing international competition. To be specific, he examined the impact of globalisation on the labour market in France. He employed a unique French data set that had firm level information on outsourcing, imports and union strength. Kramarz (2017) showed, both theoretically and empirically, that in France there are two types of companies: (i) those with strong unions in which workers captured half of the rents and (ii) firms with weaker unions where workers are paid their opportunity wage. Finally, he found that large firms decreased domestic employment when their offshoring increased. For example, an increase of 10 percentage points in the share of offshoring in sales was associated with a 1.3 percentage point decrease in employment. To conclude, firms facing strong unions increased offshoring and decreased employment.

Since many authors (e.g. Baldwin, 2016; Imbs, 2017) agree that structural change towards a factory-free economy has been happening in industrial countries for many decades, some adjustments in the policy making are inevitable. Moreover, the distinction between manufacturing and services becomes extremely blurred as many manufacturing firms have been engaging in service activities and more wholesale firms have been engaging in industry. The optimistic view suggests that manufacturing firms may be able to utilise the high value-added and skill intensive activities associated with design and innovation, as well as distribution. A less optimistic scenario emerges when we look at the impact of these trends on the industrial labour market. In the long run, economies may adjust to this shift towards a factory-free economy, but in the medium term, the personal and political issue may be significant. The most affected workers will be the older and less educated workers and those doing routine jobs who cannot easily adjust to the demands of this 'new' world. All these findings raise challenges for policy making. According to Fontagné and Harrison

(2017), industrial policy is likely to be focused on innovation (creation, design, and marketing of attractive bundles of products and services) across all sectors, not only in manufacturing. Furthermore, a more globalised world will require much greater investments into education, infrastructure and social safety nets. This will represent a big challenge for the democracies of today.

As documented, deindustrialisation is not a completely new phenomenon. It has been pointed out by many authors that it is a very common fate of all countries that grow. However, the attitude towards it changed after the latest economic crisis. While before, the shift towards service-based and knowledge-driven economy was considered natural, now people know that manufacturing still matters, and not only when looking at it directly, but mostly because it is a carrier of strongly embedded intermediate services (Peneder and Streicher, 2017).

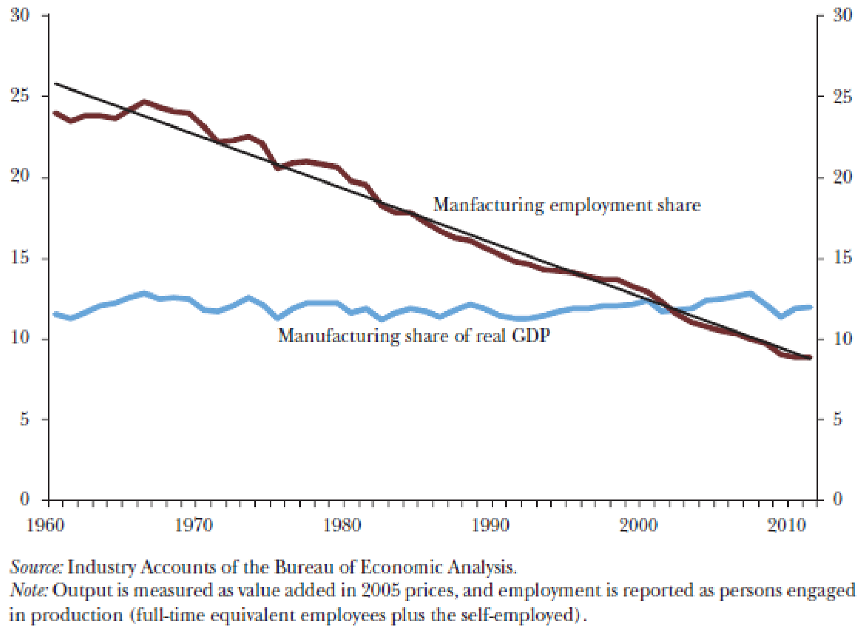
1.3 Measuring deindustrialisation

Current versus constant prices

Before we start the analysis, it is important to point out that a variety of (de)industrialisation measures can be found in literature. Some studies focus on manufacturing employment (as a share of total employment) while others rather use manufacturing value added (as a share of GDP). In the latter case, it can be calculated at constant or current prices. We must be aware of the fact that different measures yield different results. Usually, one cannot find any marked decline in manufacturing share when using value added measured at constant prices, e.g. see Figure 1.3 from Baily and Bosworth (2014) [2].

[2] See also Peneder and Streicher, 2018; Szirmai, 2012.

Figure 1.3: Manufacturing employment and value added as a share of the total US economy, 1960 – 2011, in 2005 prices



Source: Baily and Bosworth, 2014.

On one hand, we can see the striking stability of the manufacturing share of real US GDP (measured at constant prices), while on the other hand, the manufacturing employment has fallen over the past half century from about 25% in 1960 to 12% in 2010. The difference between measures in current and constant prices lies in the rapid fall of quality-adjusted relative price of manufacturing output. According to the authors, this has been almost certainly driven by the fall in the quality-adjusted prices of computers and electronic products. Thus, because the relative prices of manufactured goods have declined, the real value-added share could not decline in the same way, i.e. the real share being constant may be an overstatement. After all, it is always better to be as close to the base year as possible to get more precise calculations of real value added. In addition, manufacturing share of total US employment declined noticeably over the period of 50 years, not only in relative terms but also in absolute numbers.

Rodrik (2016) uses all three measures of deindustrialisation (real manufacturing value added, constant value added and employment). He also emphasises that manufacturing value added has remained a constant share of GDP when measured at constant prices and it is mostly due to a rapid labour productivity growth in this sector. In later sections of his work, he focuses more on employment and real manufacturing value added, since he is interested in understanding the structural changes and their determinants. As mentioned before, he found that the decline in manufacturing employment started much earlier in comparison with nominal or real value added, so the deindustrialisation process is mostly visible in the case of employment. Also, when looking at constant prices, we have to be really careful because they strongly depend on the selected base year.

Moreover, when looking at the issue in a more general way, Dietzenbacher and Temursho (2012) found that the results of input-output impact analyses do not differ much whether a framework in current prices or constant prices is used. They recommend using input-output data in constant prices if they are available, however, this is not always the case. Somewhat larger differences may occur when using data in current prices at the sectoral level, but still only up to 3.5%. On the other hand, aggregation of industries can eliminate these differences. The above-mentioned authors also warn that there can be some outliers, and these are usually the countries with somewhat larger variability in the prices of each sector. However, aggregation can again have a smoothening effect if the prices of the original sectors exhibit stronger price differences. Then, the aggregated sectors may be more uniform than the original sectors and some discrepancies may disappear. Still, we have to be very careful when interpreting results using different measures.

2 Aim of the Dissertation

The main purpose of this dissertation is to examine the current trend of the so-called deindustrialisation and find out whether the importance of manufacturing has been affected. Moreover, we want to examine for which countries it is relevant, to what extent it is present, why it is happening in the first place and what drives this process. Last but not least, we aim to examine the consequences of this phenomenon and the possible policy implications.

The direct view of deindustrialisation may be misleading, which calls for an indirect approach to examine the real extent of the issue. Nowadays, boundaries between existing industries are becoming extremely blurred. For instance, an accountant previously employed by a manufacturing company is not part of manufacturing employment anymore. Today, they work in a specialised accounting company, working for manufacturing only indirectly. This implies that a significant part of the services sector would not be created if it was not for a well-functioning manufacturing. Also, a major part of production has been offshored abroad which can again cause a decline in manufacturing in home countries. This should be taken into account when talking about deindustrialisation and the decreasing importance of industry for the development of economies.

First, we examine *the beginning of the process of deindustrialisation* in different country groups. Based on the literature review, we assume that the starting point is not uniformly set but differs not only between developed and developing economies but also among individual countries. It is assumed that the process begins in developing countries later, but starts at lower stages of their development process, i.e. at much lower levels of income. This could be harmful for this group of countries; therefore, we find it crucial to identify the beginning of deindustrialisation in different regions.

Next, there is an indication that approaching this phenomenon from the *global perspective* might reveal different results compared to the national perspective. This is closely connected to a concentration of manufacturing activities in a fewer number of more populous and lower productivity economies, particularly in East Asia. In contrast, the share of people working for manufacturing in major developed countries is decreasing. The question arises whether these different developments balance each other out so there is no decrease in global manufacturing employment or value added, or if one of the effects prevails significantly.

However, as mentioned before, we cannot underestimate the indirect effects generated by the final use of manufacturing products not only on the national level, but also from a truly global perspective. There are many activities that depend on manufacturing directly or indirectly. Many in-house manufacturing activities are now being outsourced to other industries and thus are not part of direct statistics. The process of *outsourcing* is well recognised as one of the potential drivers of deindustrialisation, however, it is not clear, to what extent it represents a strong driver in different regions. We must also remember the relevance of *offshoring* and automation as potential drivers. The shift of some manufacturing activities towards countries with lower production costs and a replacement of some routine jobs by robots definitely play a role in this process as well. Again, we are interested to what extent and for which regions these drivers represent a major threat.

To sum up, the main aim is to analyse whether the importance of manufacturing for the world economy has declined in recent years. Outsourcing and offshoring are some of the well-recognised drivers of the decreasing share of direct valued added and employment in manufacturing. However, the aim is to analyse whether the process of deindustrialisation is as strong and fast when considering the indirect activities interlinked with manufacturing as well. Moreover, we examine the importance of some less pronounced drivers of the process such as the decreasing share of domestic final expenditures on manufacturing or the effect of automation on the manufacturing output and employment. After all, new structural changes will definitely have implications for the growth prospects of both developed and developing countries and some policy adjustments will be necessary.

3 Methodology

Since many activities that were once part of manufacturing are now supplied by businesses in the service sector and many high value-added activities are being outsourced to companies outside the manufacturing industry, the analysis of deindustrialisation processes calls for an approach that considers complex linkages among industries. Input-output analysis is a useful tool for capturing these indirect effects not visible in simple statistics. A detailed description of the input-output model can be found in the publication by Miller–Blair (2009).

A part of our analysis is closely related to the work of Italian authors Montresor and Vittucci Marzetti (2010), who dealt with the so-called 'Deindustrialisation/Tertiarization (DT) hypothesis'. To reveal the real extent of the DT process, they used a subsystem analysis and applied it on the artificial world consisting of OECD7 countries covering the 1980s and the 1990s. Their results strongly support the DT hypothesis. They claim that although the weight of market services in the manufacturing subsystem increases (providing a counterbalance to manufacturing decline), subsystem shares decrease significantly, which means that the actual extent of this hypothesis is quite large. To sum up, rather than a simple reorganisation of the manufacturing subsystem, the OECD7 economy appears to be less dependent on manufacturing and this deindustrialisation appears to be accompanied by an actual tertiarization process.

Using this approach, we were also able to determine some drivers of deindustrialisation, mostly outsourcing and offshoring. In order to determine some other factors significantly contributing to the changes in manufacturing employment, we performed a structural decomposition analysis. It is described in detail in section 3.3 of this chapter. Last but not least, we used the 'Deindustrialisation model' proposed by Rodrik (2016). It is helpful in two ways. First, adjusting the model we were able to identify the development of deindustrialisation for different skill groups. Second, augmenting this model further, we were able to confirm the significance of deindustrialisation drivers identified by the method of structural decomposition (SDA). The assumptions of the model as well as the adjustment process is presented in more detail in 3.4. Lastly, a description of the data used in all approaches is presented in 3.5.

3.1 Subsystem analysis of deindustrialisation

The main purpose of production activities performed by different economic subjects is to satisfy the final demand. Because of a high division of labour, these production activities are organised within and across different industries. Firms operate at distinct stages of production. To deliver products and services for final consumers, various intermediate goods must be produced and exchanged through complex linkages among industries in the domestic economy and abroad. An input-output analysis based on Leontief model is a standard economic approach that makes it possible to capture the link between the final demand and production activities in economic systems.

The basics and the history of the model are presented well in Luptáčik (2010). The original idea for the model comes from François Quesnay's detailed accounting of intersectoral activities (tableau économique) from 1758. More than a century later, Leon Walras developed a theory of general equilibrium, which was later reformulated by Wassily Leontief. He treated the final demand and value-added components as exogenous and his first input-output tables were constructed for the U.S. economy (for 1919 and 1929). After several revisions and extensions, Leontief received the Nobel Prize for Economic Sciences in 1973. Recently, the input-output framework is widely used in energy, environmental, employment analyses and many other topics. The basic model can be described as follows: Leontief imagined an economy in which goods (iron, paper, textile products, etc.) are produced in their respective industries by means of a primary factor such as labour or by means of other inputs (such as iron, coal, textile products etc.). Thus, the economy can be classified by industries or sectors. If the economy is divided into n sectors, and if x_i is the total production (output) of sector i, and y_i is the total final demand for the product of sector i, the distribution of the output of sector i can be written as:

$$\sum_{j=1}^{n} x_{ij} + y_i = x_i \qquad (i = 1, 2, ...n) \tag{3.1}$$

Then, using these data, technical (also called input) coefficients a_{ij} can be expressed as $a_{ij} = x_{ij}/x_j$ for $(i = 1, 2, ...n)$. Coefficients a_{ij} describe the amount of good i needed for the production of one unit of good j (or produced by sector j). We assume that they are fixed, so the demand for input i changes proportionally with the output of sector j. In other words, Leontief production functions require inputs in fixed proportions, i.e. a fixed amount of each input is required to produce one unit of output. Economies of scale in production are thus ignored here and the model operates under the so-called constant returns to scale. Considering this assumption, production can be written as:

$$\sum_{j=1}^{n} a_{ij} x_j + y_i = x_i \qquad (i = 1, 2, ...n) \tag{3.2}$$

or expressed in matrix form as:

$$A\mathbf{x} + \mathbf{y} = \mathbf{x}$$

For exogenously given levels of final demand $\mathbf{y}$, the levels of total industrial output $\mathbf{x}$ are given by the following equation:

$$\mathbf{x} = (\mathbf{I} - \mathbf{A})^{-1}\mathbf{y} \tag{3.3}$$

where $\mathbf{x}$ is a vector of the total production of commodity $i = 1 \dots n$, $\mathbf{y}$ is a final demand vector and $(\mathbf{I} - \mathbf{A})^{-1}$ is the Leontief inverse matrix calculated from identity matrix $\mathbf{I}$ and the matrix of domestic flow-based input-output coefficients $\mathbf{A}$. It represents the key part of the model which shows the total production of commodity i to satisfy the final demand for one unit of commodity j.

The Leontief inverse matrix also plays a crucial role in the subsystem analysis because it allows us to construct matrix $\mathbf{B}$ that can be used as an operator to reclassify any variable from an industry base into a subsystem base (Montresor and Vittucci Marzetti, 2010). We calculate the matrix using the diagonalised vector of gross production $\hat{\mathbf{x}}$, Leontief inverse matrix $(\mathbf{I}-\mathbf{A})^{-1}$ and the diagonalised final demand vector $\hat{\mathbf{y}}$

$$\mathbf{B} = \hat{\mathbf{x}}^{-1}(\mathbf{I}-\mathbf{A})^{-1}\hat{\mathbf{y}} \tag{3.4}$$

Matrix $\mathbf{B}$ shows the proportion of the activity of industry i which comes under subsystem j. By definition, the sum of each row of $\mathbf{B}$ adds up to 1 [1]. In the context of inter-country input-output model, matrix $\mathbf{B}$ shows the proportion of the activity of industry i originated in country s or region r which comes under subsystem j in country s or region r. $\mathbf{B}$ can be used to reclassify the data on employment by industries in vector $\mathbf{e}$ from the industrial base into the subsystem base by pre-multiplying matrix $\mathbf{B}$ by the diagonalised vector $\mathbf{e}$.

$$\mathbf{N} = \hat{\mathbf{e}}\mathbf{B} \tag{3.5}$$

The elements in matrix $\mathbf{N}$ show the amount of labour required directly and indirectly by industry i in order to satisfy the final demand for commodity j. The sum of rows of $\mathbf{N}$ equals the number of workers in each industry. The sum of columns of matrix $\mathbf{N}$ shows the total number of workers from each industry that is necessary to satisfy the final demand for commodity j. By dividing each element in matrix $\mathbf{N}$ by the total of the corresponding column, we can calculate matrix $\mathbf{C}$ measuring the share accounted for by industry i on total labour required by the final demand of subsystem j.

$$\mathbf{C} = \mathbf{N}\hat{\mathbf{n}}^{-1} \tag{3.6}$$

where $\mathbf{n} = \mathbf{i}'\mathbf{N}$ is a sum of each column in matrix $\mathbf{N}$. In a similar way, we can calculate the amount and the share of value added that is required by individual subsystems. We only need to substitute the vector of labour requirements $\mathbf{e}$ in equation (3.5) by the vector of value added by industries.

[1] The sum of rows of matrix $\mathbf{B}$ is given by $\mathbf{Bi}$, where $\mathbf{i}$ is a summation vector. Thus, $\mathbf{Bi} = \hat{\mathbf{x}}^{-1}(\mathbf{I}-\mathbf{A})^{-1}\hat{\mathbf{y}}\mathbf{i}$. Because $\mathbf{y} = \hat{\mathbf{y}}\mathbf{i}$ and equation (3.3) holds, we can write $\mathbf{Bi} = \hat{\mathbf{x}}^{-1}\mathbf{x} = \mathbf{i}$.

In order to calculate the effects of offshoring on employment and value added or the participation of G7 in the global final demand for manufacturing products, it is necessary to use the *inter-country input-output model*. Here, it is inevitable to work with the world input-output tables (instead of the national ones) to calculate the effects in industry i in country s or region r generated by the final use of commodity j in country s or region r. Since the flows are captured between 44 regions and 56 industries, we work with a table with the size of *2464 x 2464*. To capture all important effects between different kinds of regions, we aggregated them into 4 regions and 3 industries. Then, we can calculate the total employment/value added generated by the final demand for manufacturing products in country s as the sum of elements in a corresponding column in the matrix $\mathbf{G_e}$. Matrix $\mathbf{G_e}$ can be expressed as follows:

$$\mathbf{G_e} = \mathbf{\hat{e}B} \tag{3.7}$$

where matrix $\mathbf{B}$ can be again used to reclassify the data on employment by industries in a vector $\mathbf{e}$ from industrial base into the subsystem base by pre-multiplying the matrix $\mathbf{B}$ by diagonalised employment vector $\mathbf{e}$. The elements in matrix $\mathbf{G_e}$ show the amount of labour required directly and indirectly from industry i in country s or region r to satisfy the final demand for commodity j in in country s or region r. The sum of rows of $\mathbf{G_e}$ equals the number of workers employed directly in each particular industry and region. The sum of columns of matrix $\mathbf{G_e}$ shows the total number of workers from each industry that is necessary to satisfy the final demand for commodity j in country s or region r. By dividing each element in matrix $\mathbf{G_e}$ by the sum of the corresponding column, we can calculate the matrix $\mathbf{C_e}$ that measures the share accounted for by industry i from country s or region r in total labour required by the final demand for goods of subsystem j in country s or region r:

$$\mathbf{C_e} = \mathbf{G_e}\mathbf{\hat{m}}^{-1} \tag{3.8}$$

where $\mathbf{\hat{m}} = \mathbf{i}'\mathbf{G_e}$ is a sum of each column in matrix $\mathbf{C_e}$. In a similar way, we can calculate the amount and a share of value added that is required by individual subsystems. We only need to substitute the vector of labour requirements $\mathbf{e}$ in equation (3.7) by the vector of value added $\mathbf{v}$.

3.2 Deindustrialisation measures

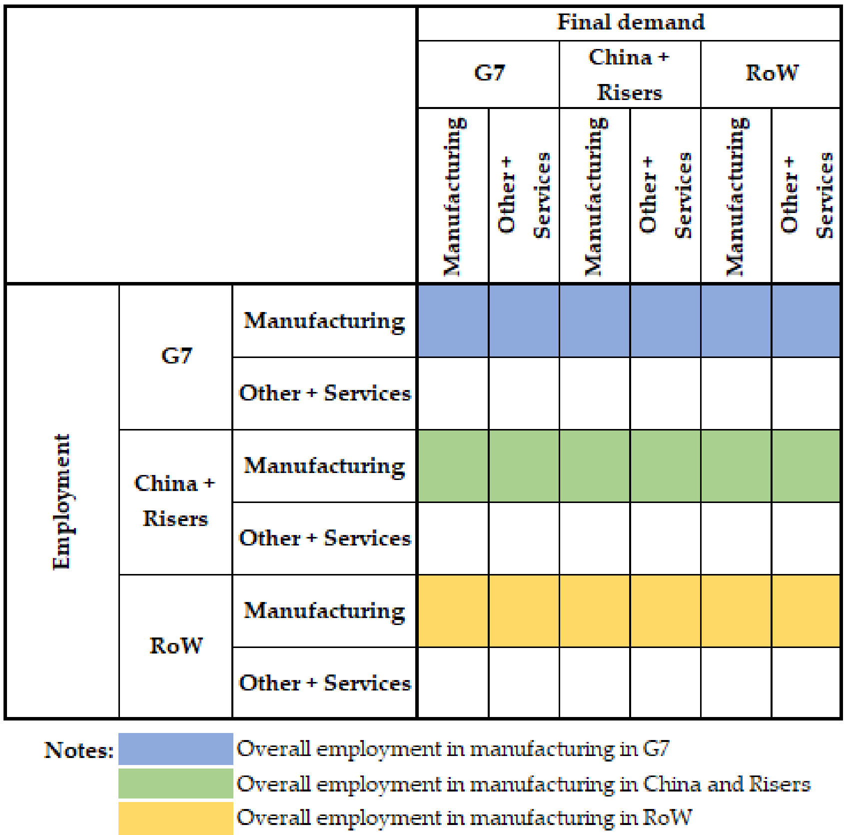
The observed deindustrialisation is measured either in terms of employment or value added in manufacturing. We explain the main measures used in the analysis for the case of employment but we apply them in terms of value added as well.

As previously mentioned, matrix $\mathbf{G_e}$ shows the amount of labour required directly and indirectly from industry i in country s or region r to satisfy the final demand for goods in industry j in country s or region r. For reasons of simplicity, we assume there are two industries only. Manufacturing, labelled m, and non-manufacturing industry, labelled n. Then, we can calculate the employment in manufacturing in country s as the sum of a particular row of matrix $\mathbf{G_e}$

$$e^{s.}_{m.} = e^{ss}_{mm} + e^{ss}_{mn} + e^{sr}_{mm} + e^{sr}_{mn} \tag{3.9}$$

This illustrates the merits of the subsystem approach that can reproduce the direct employment in manufacturing in particular countries in terms of the employment generated by each particular subsystem (by a global final demand). We present it graphically below (3.1).

Figure 3.1: Observed deindustrialisation from a subsystem perspective



Source: Author based on data from WIOD.org.

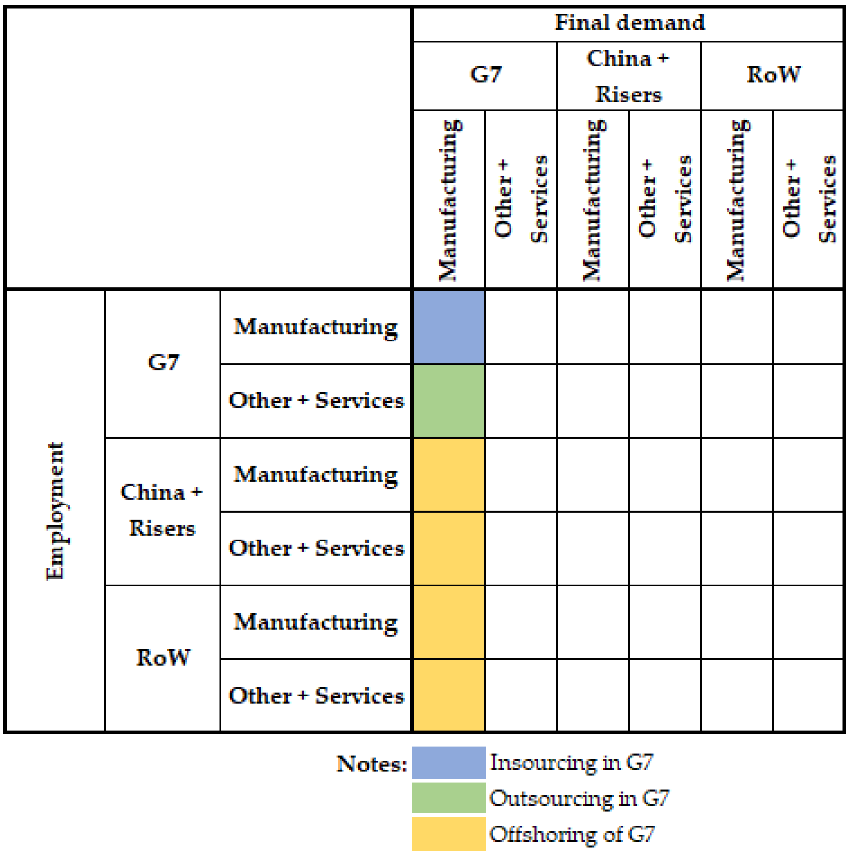
We explicitly show that the value added generated within manufacturing in G7 countries originates from the final demand for manufacturing products in G7 countries, the final demand for other commodities in G7 countries, the final demand for manufacturing products abroad, or from the final demand for other commodities abroad (blue row).

The subsystem approach (also called the final consumption expenditures approach) is based on a ‘column’ perspective. We can calculate the total employment generated by the final demand for manufacturing products in country s as the sum of elements in a corresponding column in matrix $\mathbf{G_e}$

$$e_{.m}^{.m} = e_{mm}^{ss} + e_{nm}^{ss} + e_{mm}^{rs} + e_{nm}^{rs} \tag{3.10}$$

We refer to e_{mm}^{ss} as *insourcing* because it shows the employment in manufacturing in country s generated by the final demand for manufacturing products in this country. It corresponds to in-house activities within manufacturing. Element e_{nm}^{ss} shows the employment in non-manufacturing industries in country s generated by its final demand for manufacturing products. It is the employment generated directly and indirectly by the final demand for manufacturing products in country s in industries outside the manufacturing but within the same (domestic) economy. We define this as *outsourcing*. The last two elements e_{mm}^{rs} and e_{nm}^{rs} stand for the employment generated by the final demand for manufacturing products in country s abroad. They include foreign employment both in manufacturing and non-manufacturing that is generated under the manufacturing subsystem of country s. We refer to them as *offshoring*. See the following figure for a graphical representation (3.2).

Figure 3.2: Insourcing, outsourcing and offshoring in G7

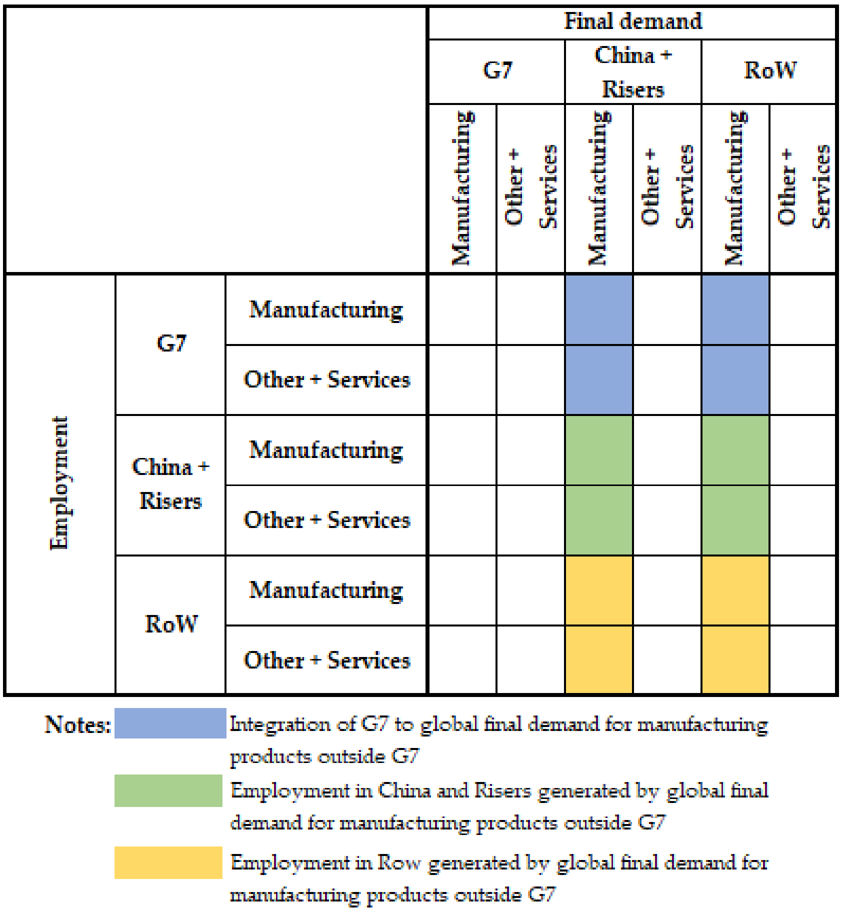


Source: Author based on data from WIOD.org.

In a situation of internationally fragmented production structures, countries can benefit from the participation in manufacturing subsystems of other regions. This is especially relevant in a situation of rising final demand for manufacturing products in fast growing countries. The participation of country s in manufacturing subsystems of other regions can counterbalance the effects of offshoring in the domestic employment generated under their own manufacturing subsystem. We calculate the employment generated in country s by the final demand for manufacturing products in region r as follows (again, Figure 3.3 shows a graphical representation)

$$e^{sr}_{.m} = e^{sr}_{mm} + e^{sr}_{nm} \tag{3.11}$$

Figure 3.3: Integration of G7 in the global manufacturing subsystems outside G7

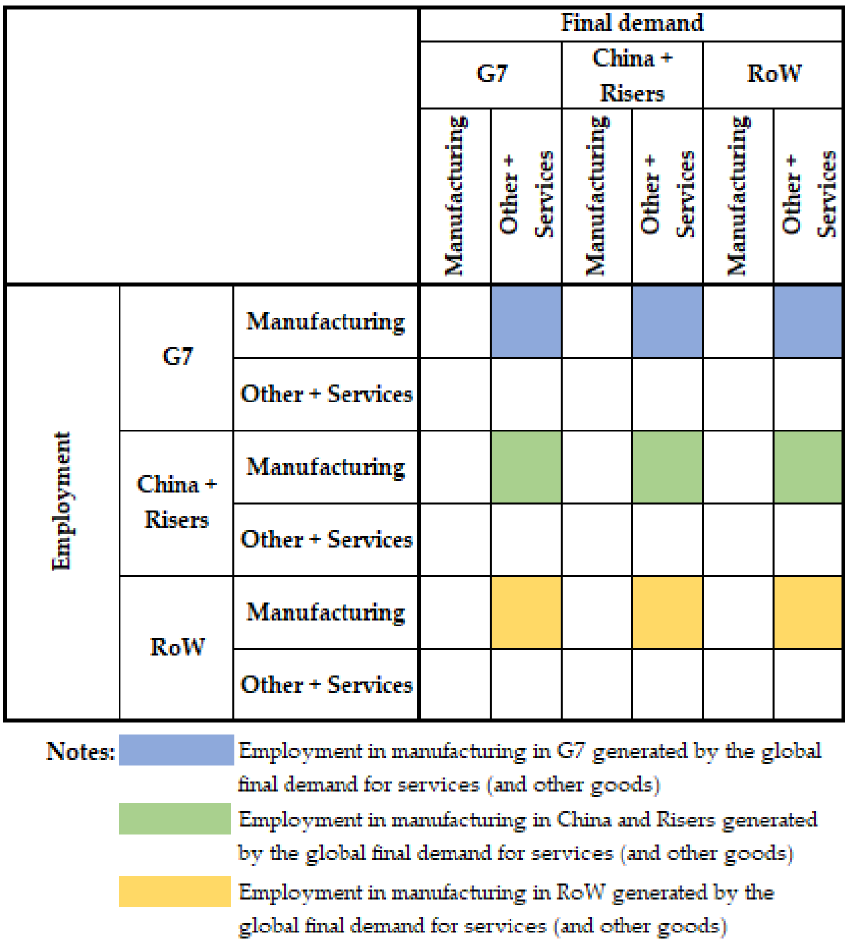


Source: Author based on data from WIOD.org.

We can also look at the issue from a slightly different angle and calculate the integration of manufacturing in different countries to global final demand for services. In other words, we look at the participation of manufacturing in service subsystems. The employment generated in country s by the global final demand for services can be expressed as follows (see Figure 3.4 for a graphical representation)

$$e_{mn}^{s.} = e_{mn}^{ss} + e_{mn}^{sr} \tag{3.12}$$

Figure 3.4: Integration of manufacturing in the final demand for services



Source: Author based on data from WIOD.org.

3.3 Structural decomposition analysis

In general, structural decomposition techniques are used to break down the growth of a given variable into changes in its determinants. There is a extensive literature dealing with this methodology in the framework of input-output, for instance chapter 13 in the monograph by Miller and Blair (2009) or papers by De Boer (2009) and Dietzenbacher and Los (1998). From the historical point of view, the analysis of changes in the structure of production has a long tradition and it dates back to Leontief (1953). Later, this type of analysis experienced a great revival in the 1980s. Moreover, the methodology of structural decomposition is very similar to that of growth accounting, where we want to break down the growth in the aggregate output into the contributions of the growth in inputs and the growth in technology. Similar processes are also used in demographic accounting or shift share analysis (Rose and Casler, 1996; Dietzenbacher and Los, 1998).

In the last of the papers mentioned above (Dietzenbacher and Los, 1998), the sense and sensitivity of the methods are examined since there is a multitude of equivalent decomposition forms which measure the contribution of a specific determinant to the growth of some variable. To begin with, it is a well-known fact that the results of structural decompositions are not unique (not only one solution exists). There are two predominant approaches used in literature – the average of the so-called polar decompositions and the approximate decomposition with mid-point weights. On theoretical grounds, no form is to be preferred to the others. This can be demonstrated using the simplest example with only two determinants affecting the change in a certain variable. For instance, in the framework of input-output, generated production depends on the Leontief inverse (including both direct and indirect linkages) and the final demand. Analytically, this can be written as follows: $\mathbf{x} = \mathbf{L}\mathbf{y}$. Since production changes over time, we are interested in the change in this variable between two periods, period 1 (current or comparison period) and 0 (base period). We are also interested in the contribution of the changes in the structure of production ($\Delta\mathbf{L}$) and final demand ($\Delta\mathbf{y}$). There are two alternative ways how to additively decompose the change in $\mathbf{x}$

into the changes in its alternatives:

$$\mathbf{\Delta x} = (\mathbf{\Delta L})\mathbf{y}^0 + \mathbf{L}^1(\mathbf{\Delta y}) \tag{3.13}$$

$$\mathbf{\Delta x} = (\mathbf{\Delta L})\mathbf{y}^1 + \mathbf{L}^0(\mathbf{\Delta y}) \tag{3.14}$$

These equations are equivalent and there is no reason to prefer one at the expense of the other. Both methods are correct and exact, i.e. contributions on the right-hand side add up to $\mathbf{\Delta x}$. Thus, a commonly used solution is to take the mean of the two expressions:

$$\mathbf{\Delta x} = (\mathbf{\Delta L})\mathbf{y}(\mathbf{1/2}) + \mathbf{L}(\mathbf{1/2})(\mathbf{\Delta y}) \tag{3.15}$$

The result is again exact and, moreover, both $\mathbf{\Delta}$ expressions have the same type of weights. Therefore, this is usually preferred to the above-mentioned polar decompositions. However, this solution is possible only in the case of two determinants. If we have more determinants (n) which have an impact on the change in some variable, the situation is more complicated. Now, there are $n!$ different ways of using the weights and again, there is no reason to prefer one to the other. If we used the average, the decomposition with more determinants would not be exact or ideal, even though the differences are not large. The most common is an ad hoc solution of taking the average of the two polar (i.e. working through the original ordering $\{1,...n\}$ from left to right and also from right to left) or all possible decompositions. All these forms are equivalent and, typically, the average effects of polar and full decompositions are remarkably close to each other. Next, De Boer (2009) proposed to use the 'ideal' Montgomery decomposition or the Sato-Vartia decomposition if the number of determinants is large. In these cases, it is sufficient to compute only one decomposition instead of $n!$.

In general, we distinguish an additive and a multiplicative form of the decomposition, where the aggregate change in each variable is the difference or the ratio between its value in the 'current' period 1 and the base period 0, respectively. In this thesis, we considered the multiplicative decomposition of the variable V, simply expressed as $\mathbf{DV(1,0)} = \mathbf{V^1/V^0}$. We have chosen this form of analysis, since the aim is to decompose the *index of employment growth* into the contributions of several determinants. In the case of absolute changes, it is more appropriate to use the additive form of the decomposition analysis. Using this method, we are able to say which determinants caused the growth in manufacturing employment over time. This helps us determine whether we should predominantly blame the changes in the productivity of labour, or rather changes in the technology of production or changes in the structure of the final demand.

As far as data is concerned, our decomposition is based on the world input-output tables in current prices covering the periods of 1995 – 2009 (Release 2013) and 2000 – 2014 (Release 2016). Using the previous years prices (available for 1995 – 2009), we were also able to perform the decomposition in constant prices, but only for the older period.

Thus, using this approach, we broke down the change in the manufacturing employment growth index into the contributions of several factors: changes in labour productivity, changes in the structure of production, changes in the use of domestic intermediates (offshoring/outsourcing), changes in the use of domestic intermediates (insourcing), changes in the manufacturing final demand structure, changes in the share of manufacturing expenditures on the total final demand, changes in the final demand structure and changes in the final demand volume. First, we need to calculate the overall employment in manufacturing. Employment generated directly and indirectly by the final demand for manufacturing products can be expressed as follows

$$e^m = \mathbf{e}_c^{'}(\mathbf{I} - \mathbf{A}^D)^{-1}\mathbf{y}^m \tag{3.16}$$

where $\mathbf{e}_c^{'}$ represents the direct employment coefficients vector calculated as a ratio between employment in industry j and the total production of industry j, i.e. the labour requirements per one unit of production (inverse of labour productivity),

$\mathbf{A}^D$ is a matrix of input coefficients, where the upper index D indicates the use of domestic intermediates,

$\mathbf{y}^m$ stands for the final demand for manufacturing products, and matrix $(\mathbf{I}-\mathbf{A}^D)^{-1}$ is the traditional Leontief inverse representing complex linkages among industries.

Equation 3.16 can be further decomposed to

$$e^m = \mathbf{e}_c^{'}(\mathbf{I}-\mathbf{A}^T \circ \mathbf{D})^{-1}\mathbf{b}^m s^m y \tag{3.17}$$

In particular, we can break down the input coefficient matrix $\mathbf{A}^D$ into two components and the final demand vector for manufacturing products $\mathbf{y}^m$ into three components. The use of domestic intermediate products per unit of production is given by the total use of intermediate goods and the share of domestic intermediates in total inputs. Thus, $\mathbf{A}^D = \mathbf{A}^T \circ \mathbf{D}$, where $\mathbf{D}$ is the matrix of import shares of domestic products, while $\mathbf{A}^T$ is the matrix of total input coefficients based on domestic and imported commodities. Symbol $\circ$ stands for the element-wise multiplication of the matrices (the so-called Hadamard product operation).

Next, to separate changes in the domestic demand and export, we can write

$$e^m = \mathbf{e}_c^{'}(\mathbf{I}-\mathbf{A}^T \circ \mathbf{D})^{-1}\mathbf{B}^m \widehat{\mathbf{s}^m}\mathbf{s}^y y \tag{3.18}$$

where $\mathbf{B}^m = \begin{bmatrix} \mathbf{0} & \mathbf{0} \\ \mathbf{b}^{m,dd} & \mathbf{b}^{m,ex} \\ \mathbf{0} & \mathbf{0} \end{bmatrix}$, $\mathbf{b}^{m,dd}$ are the shares of domestic final demand for manufacturing products in individual industries on the total domestic final demand for manufacturing products. Thus, the sum of the elements in $\mathbf{b}^{m,dd}$ equals 1. Similarly, $\mathbf{b}^{m,ex}$ represents the shares for exports and they also add up to 1.

$\mathbf{s}^m$ is a vector of two elements. $s^{m,dd}$ is the share of domestic demand for manufacturing products on the domestic final demand. Accordingly, $s^{m,ex}$ is the share of the exports of manufacturing products on the total exports.

$\mathbf{s}^y$ is a two-element vector as well. s^{dd} is the share of the domestic final demand on the total final demand y. s^{ex} is the share of the exports of final products on the total final demand y. The sum of s^{dd} and s^{ex} equals 1.

$\mathbf{y}$ is a scalar and expresses the final demand volume.

Moreover, inspired by the hierarchical decomposition by Koller, Croner et al. (2018), we can also break down the share of domestic input coefficients $\mathbf{D}$ into the so-called outsourcing/offshoring D_o and insourcing D_i, so $D = D_o + D_i$. To be more exact, if the domestic share of an intermediate input increases, we observe outsourcing/offshoring. In the other case, when the domestic share of an intermediate input decreases, we can talk about insourcing.

Equation 3.18 suggests that the total employment in manufacturing depends not only on labour productivity or the volume of final demand, but also on several other factors.

Thus, the multiplicative structural decomposition can be expressed in the following way:

$$\frac{E_1^m}{E_0{}^m} = \frac{e_1^c(I - A_1^T \circ D_1)^{-1} \hat{B}_1^m s_1^m s_1^y y_1}{e_0^c(I - A_0^T \circ D_0)^{-1} \hat{B}_0^m s_0^m s_0^y y_0} \tag{3.19}$$

where $D = D_o + D_i$

The manufacturing employment growth index is given by changes in the above-mentioned determinants, thus:

$$D_E = \frac{E_1^m}{E_0{}^m} = D_{ec} \times D_{At} \times D_{Do} \times D_{Di} \times D_{Bm} \times D_{sm} \times D_{sy} \times D_y \tag{3.20}$$

where D_E is the manufacturing employment growth index,

D_{ec} is a weighted change in labour productivity,

D_{At} is a weighted change in the total technical coefficient matrix (in the structure of production),

D_{Do} is a weighted change in the use of domestic intermediates (offshoring/outsourcing),

D_{Di} is a weighted change in the use of domestic intermediates (insourcing),

D_{Bm} is a weighted change in the manufacturing final demand structure,

D_{sm} is a weighted change in the structure of the final demand for manufacturing,

D_{sy} is a weighted change in the final demand structure, and

D_y is a weighted change in the final demand volume.

The first polar decomposition starts with the base period weights (0) for the first factor and ends with the current period weights (1) for the last factor. The upper index stands for the first polar decomposition. Thus, we can write it as follows:

$$D^1_{ec} = \frac{e^c_1(I - A^T_0 \circ (Do_0 + Di_0))^{-1} \hat{B}^m_0 s^m_0 s^y_0 y_0}{e^c_0(I - A^T_0 \circ (Do_0 + Di_0))^{-1} \hat{B}^m_0 s^m_0 s^y_0 y_0}$$

$$D^1_{At} = \frac{e^c_1(I - A^T_1 \circ (Do_0 + Di_0))^{-1} \hat{B}^m_0 s^m_0 s^y_0 y_0}{e^c_1(I - A^T_0 \circ (Do_0 + Di_0))^{-1} \hat{B}^m_0 s^m_0 s^y_0 y_0}$$

$$D^1_{Do} = \frac{e^c_1(I - A^T_1 \circ (Do_1 + Di_0))^{-1} \hat{B}^m_0 s^m_0 s^y_0 y_0}{e^c_1(I - A^T_1 \circ (Do_0 + Di_0))^{-1} \hat{B}^m_0 s^m_0 s^y_0 y_0}$$

$$D^1_{Di} = \frac{e^c_1(I - A^T_1 \circ (Do_1 + Di_1))^{-1} \hat{B}^m_0 s^m_0 s^y_0 y_0}{e^c_1(I - A^T_1 \circ (Do_1 + Di_0))^{-1} \hat{B}^m_0 s^m_0 s^y_0 y_0}$$

$$D^1_{Bm} = \frac{e^c_1(I - A^T_1 \circ (Do_1 + Di_1))^{-1} \hat{B}^m_1 s^m_0 s^y_0 y_0}{e^c_1(I - A^T_1 \circ (Do_1 + Di_1))^{-1} \hat{B}^m_0 s^m_0 s^y_0 y_0}$$

$$D^1_{sm} = \frac{e^c_1(I - A^T_1 \circ (Do_1 + Di_1))^{-1} \hat{B}^m_1 s^m_1 s^y_0 y_0}{e^c_1(I - A^T_1 \circ (Do_1 + Di_1))^{-1} \hat{B}^m_1 s^m_0 s^y_0 y_0}$$

$$D^1_{sy} = \frac{e^c_1(I - A^T_1 \circ (Do_1 + Di_1))^{-1} \hat{B}^m_1 s^m_1 s^y_1 y_0}{e^c_1(I - A^T_1 \circ (Do_1 + Di_1))^{-1} \hat{B}^m_1 s^m_1 s^y_0 y_0}$$

$$D^1_{y} = \frac{e^c_1(I - A^T_1 \circ (Do_1 + Di_1))^{-1} \hat{B}^m_1 s^m_1 s^y_1 y_1}{e^c_1(I - A^T_1 \circ (Do_1 + Di_1))^{-1} \hat{B}^m_1 s^m_1 s^y_1 y_0} \tag{3.21}$$

On the other hand, the second polar decomposition starts with the weights (1) for the first factor and ends with the base period weights (0) for the last determinant. So, the second decomposition is obtained by reversing the index for weights. Again, the change in the total manufacturing employment can be decomposed to the contributions of $D_{ec}^2, D_{At}^2, D_{Do}^2, D_{Di}^2, D_{Bm}^2, D_{sm}^2, D_{sy}^2$, and D_y^2. In this case, the upper index stands for the second polar decomposition. The results of both decompositions are exact in a sense that the expression on the right-hand side is equal to the one on the left-hand side, but the contributions of individual determinants slightly differ. Therefore, we calculate a mean for the contribution of each factor. As mentioned above, it is a commonly used solution in empirical analyses. Then, for example, the contribution of labour productivity to the manufacturing employment growth, where avg stands for an average, can be expressed as:

$$D_{ec}^{avg} = (D_{ec}^1 \times D_{ec}^2)^{\frac{1}{2}} \tag{3.22}$$

The same procedure was applied to all determinants and the final decomposition can be written as

$$D_E = D_{ec}^{avg} \times D_{At}^{avg} \times D_{Do}^{avg} \times D_{Di}^{avg} \times D_{Bm}^{avg} \times D_{sm}^{avg} \times D_{sy}^{avg} \times D_{y}^{avg} \tag{3.23}$$

Additionally, mainly to include the potential determinants of deindustrialisation identified by SDA into the Rodrik's deindustrialisation model, we performed the decomposition of changes in the manufacturing employment also between each year in the sample.

3.4 Deindustrialisation model

To analyse deindustrialisation for different skill types of workers and to verify the potential drivers of deindustrialisation, we used a model originally proposed byRodrik

(2016). In the first case, we also used the WIOD Socio-Economic Accounts (Timmer, 2012) containing data for three worker types: low skill, medium skill and high skill. Data are available for 40 countries and the period of 1995 – 2009. Here, dependent variable $manshare_{it}$ is the share of manufacturing on the total employment by skill groups. We performed an analysis for direct but also for generated shares.

In the next step, to analyse the potential drivers of deindustrialisation trends, we again used the "Deindustrialisation model" proposed by Rodrik (2016), but with additional covariates in $\mathbf{X}\boldsymbol{\gamma}$:

$$manshare_{it} = \beta_0 + \beta_1(lnpop_{it}) + \beta_2(lnpop_{it})^2 + \beta_3(lny_{it}) + \beta_4(lny_{it})^2 + \mathbf{X}\boldsymbol{\gamma} + \alpha_i + p_t + \epsilon_{it} \tag{3.24}$$

where $manshare_{it}$ represents the importance of manufacturing in country i and period t, pop_{it} is the population in country i and period t, y_{it} is GDP per capita in country i and period t , α_i are country fixed effects, and p_t are time dummies.

We diverge from the basic model proposed by Rodrik (2016) in two dimensions. First, as we argued above, we measure the importance of manufacturing (manufacturing share) in terms of direct and indirect employment generated by the final demand for manufacturing products. Second, potential determinants of deindustrialisation identified by the structural decomposition analysis will be used as covariates in $\mathbf{X}\boldsymbol{\gamma}$. Moreover, in subsequent steps, we also added a variable on the number of robots per population and employment to estimate the possible effects of automation on deindustrialisation.

3.5 Data

The analysis is mainly based on data from the World Input-Output Database. The version released in 2013 covers the period from 1995 to 2011 including Socio-Economic Accounts. Here, we used the overall employment data and also employment data for the three worker skill type categories mentioned above. The coverage of the data is for 1995 – 2009 and 40 countries, mostly from Europe, in particular 27 EU countries and 13 other major countries in the world. For the purpose of structural decomposition analysis, we also used the world input-output tables in previous years prices available for 1995 – 2009. It enabled us to perform a decomposition in constant prices, as well.

The new release, an update of the World Input-Output Database (WIOD) from 2016, features data from 2000 to 2014. They are available for 43 countries (28 EU countries and 15 other major economies) which together represent more than 85% of the world GDP (at current exchange rates).[2] Moreover, the new release includes data on 56 industries and products (compared to 35 in the 2013 WIOD release) which are structured according to the recent industry and product classification, i.e. ISIC Rev. 4 or equivalently NACE Rev. 2. All data are expressed in current prices and together cover the overall economy. The number of industries has increased mainly in manufacturing and business services. Since the 2016 WIOD is an update of the 2013 WIOD, it is constructed according to the same methodology. However, various improvements and extensions were made, so the data from different releases are not comparable to each other (Timmer et al., 2016).

Data on population and GDP per capita were obtained from the Penn World Table 9.0 Database (Timmer and Feenstra, 2015). For determining the beginning of deindustrialisation, we used the GGDC[3] 10-Sector Database, which provides a long-term internationally comparable dataset on value added or persons employed for 10 broad sectors (Timmer et al., 2015). For many countries, it contains data even starting in 1950 and for almost all countries the data starts from 1970 onwards. When it comes to country coverage, it contains series for 11 countries in Africa, 11 countries in Asia, 2 countries in the Middle East and North Africa, 9 in Latin-America and also for the US and 8 European countries.[4] Data on the stock of robots in different countries used in the regression model on deindustrialisation come from the International Federation of Robotics (IFR) Database (IFR, 2017).

[2] Countries which were not available in the previous release are Switzerland, Croatia and Norway. For the list of all countries, see Appendix 1.

[3] Groningen Growth and Development Centre

[4] For the list of all countries, see Appendix 2.

4 Empirical Results and Discussion

First, we will try to identify the beginning of the deindustrialisation processes in various country groups and then an analysis of manufacturing in terms of value added will be provided. The analysis is mainly based on data from input-output tables available on the WIOD website, and on the GGDC 10-Sector Database. The term 'manufacturing' indicates industries included in the C (10–33) category of The Statistical Classification of Economic Activities in the European Community, commonly referred to as NACE Rev. 2 (2008) or ISIC Rev. 4. The classification of manufacturing and other industries used in the analysis can be seen in Appendix 4. The aggregation of countries into regions follows the country classification of the United Nations and is provided in Appendix 3.

Afterwards, the subsystem approach following Montresor and Vittucci Marzetti (2010) is applied. It captures the share of value added and employment generated by the final demand for manufacturing products in market services, or in other words, outsourcing. We also expand this approach in the context of internationally fragmented production structures. This allows us to identify not only the role of outsourcing for the observed deindustrialisation but also the effects of offshoring on deindustrialisation. Lastly, using this approach, we identify the effects of changes in global final demand for manufacturing products on subsequent economic activities around the globe.

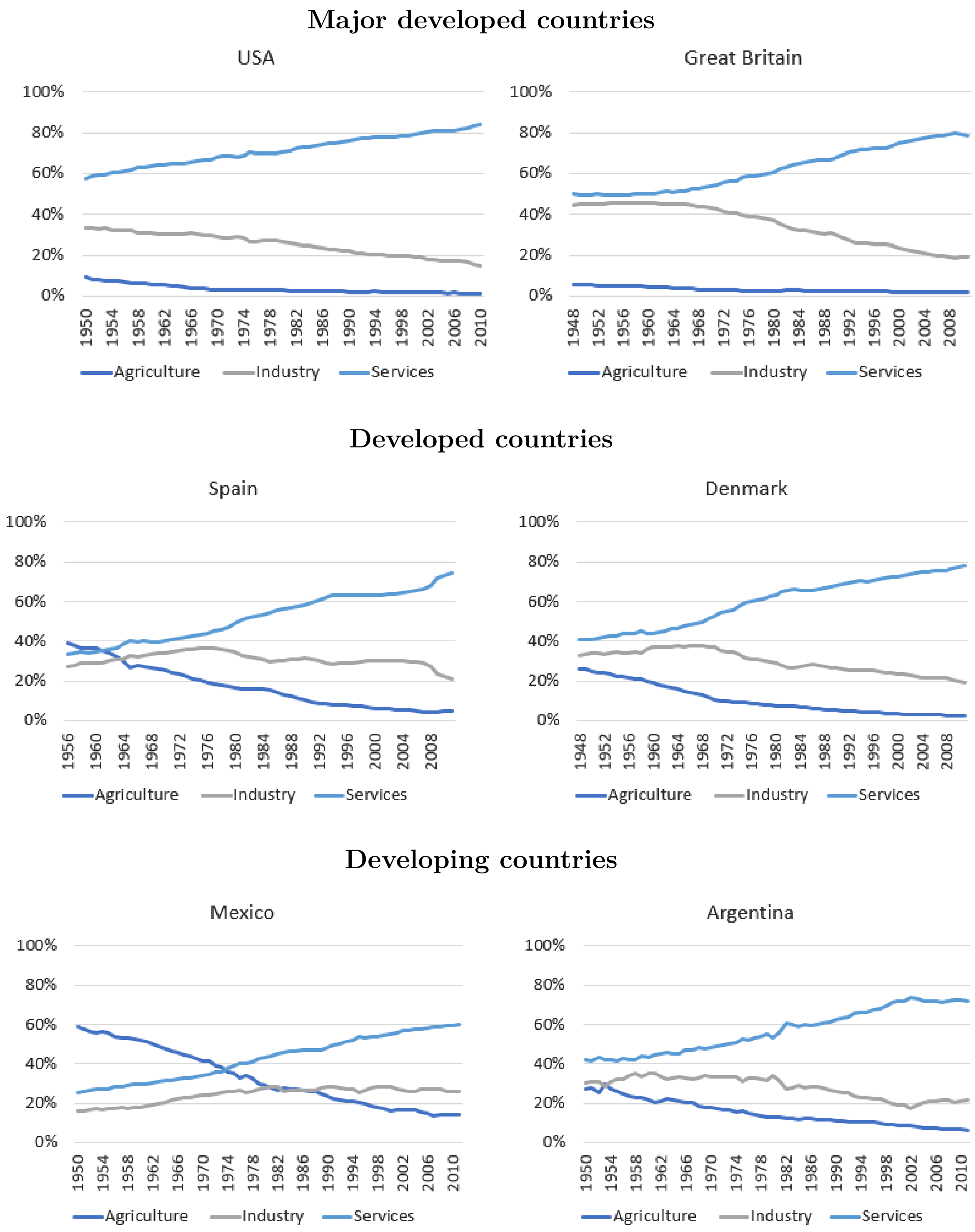
Furthermore, we performed a structural decomposition analysis to determine other major sources of changes in the overall manufacturing employment. Then, we added them as covariates into the model of deindustrialisation proposed by Rodrik (2016) and verified their significance. In the last step, we estimated the potential effects of automation on employment in manufacturing, also using the aforementioned model.

4.1 The beginning of deindustrialisation

As mentioned before, deindustrialisation is most frequently described as a falling share of value added and employment in manufacturing on the total GDP and employment, respectively. However, there is no clear-cut answer on the question when exactly this process started. In fact, it varies across different country groups and in some cases among individual countries as well. Most of the advanced economies moved to a new, post-industrial era already some decades ago. It is mostly visible when looking at the employment shares. Most of these countries reached their peaks in manufacturing employment in the 1950s or 1960s. When looking at Figure 4.1, we can see that in the case of the United States, the share of persons employed in industry in the period for which the data were available is only declining, i.e. it reached the turning point way before 1950. The peak in industry employment in the United Kingdom was reached in the middle of the 1950s. The story is very similar for the rest of the G7 countries. We can also observe that this decline was almost perfectly compensated by the increasing employment in services. The scenario is quite similar for developed economies. These countries reached the maximum relative employment in industry during the 1960s and 1970s. Again, the loss of manufacturing jobs was more than compensated by the growing number of jobs in services. For instance, in Spain, the share decreased from almost 30% in 1956 to 20% in 2011.

The picture is somewhat different when looking at the group of developing countries. It is very difficult to determine the exact beginning of the deindustrialisation process for the whole group. Most of the countries reached the peak in the 1980s or early 1990s. In the case of Argentina, as presented in Figure 4.1, the share of employment in industry reached the turning point at the value of 34% in 1980 (21% in manufacturing alone). Simultaneously, the growth of the services sector is observable as well. According to Castillo and Neto (2016), in Argentina, this growth has been mostly led by wholesale, retail and repairs, followed by real estate and rental activities. On the other hand, in Mexico, the share of employment in industry has been quite stable in the last decades with a less prominent increase in services.

Figure 4.1: Employment in industry, share on the total employment, samples from different country groups

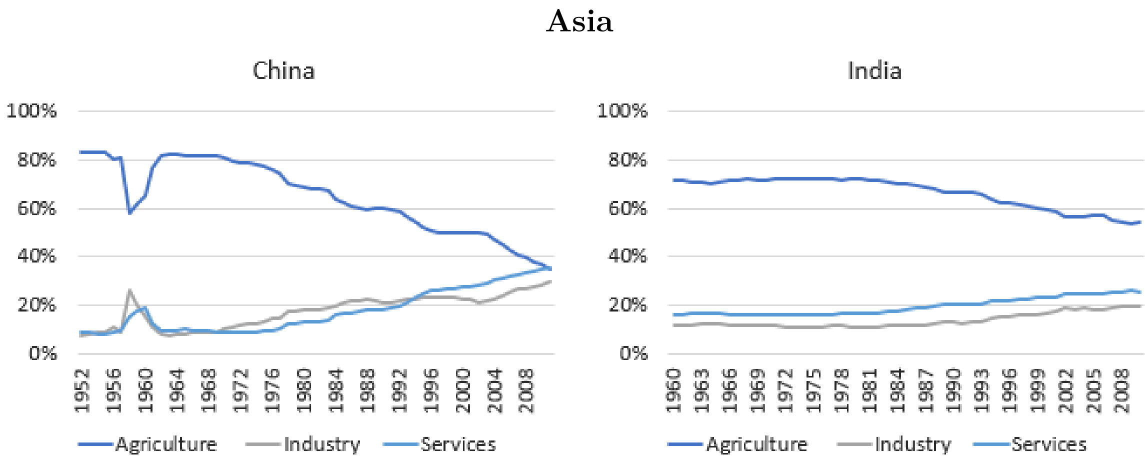


Note: The beginning of the time series varies across countries depending on data availability.

Source: Author's calculations based on data from Timmer et al. (2015).

Looking at Asian countries (Figure 4.2), we observe a different trend. Many of them (most notably China and India, but also Indonesia, Korea or Taiwan) were able to avoid the process of deindustrialisation and they were even able to bring in new manufacturing jobs. This could be closely connected to the fact that Asian countries have a comparative advantage in manufacturing. This can also serve as an evidence for the relocation of some manufacturing activities from the richer parts of the world such as the United States or Europe into Asia, particularly to China. Manufacturing performance is even stronger here than would be expected considering its income and demography (Rodrik, 2016). Moreover, it seems that activities in industry are closely related to services, since their trajectories of development are quite coordinated.

Figure 4.2: Employment in industry in Asia, share on the total employment

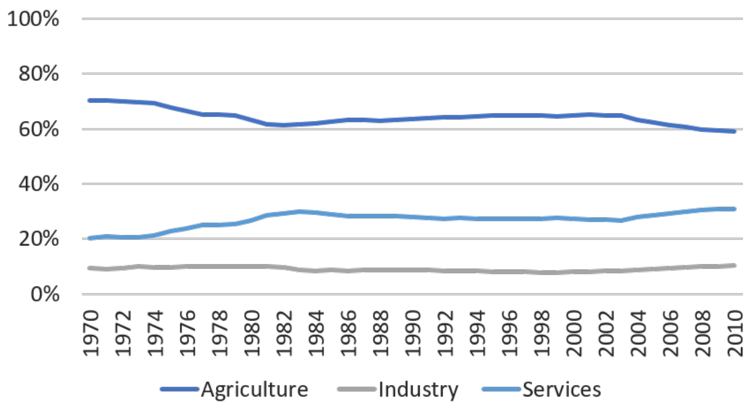


Note: The beginning of the time series varies across countries depending on data availability.

Source: Author's calculations based on data from Timmer et al. (2015).

In Sub-Saharan Africa (in our sample data for Botswana, Ethiopia, Ghana, Kenya, Malawi, Mauritius, Nigeria, Senegal, South Africa, Tanzania and Zambia), still a substantial share of people work in agriculture (Figure 4.3). The employment in industry is very low, merely 10% and it has not changed much since the 1970s. Moreover, their share of manufacturing employment is lower than we would expect on the basis of their level of income per capita, as mentioned also in Castillo and Neto (2016). Since the manufacturing sector in poor African regions is not growing, the rapid economic growth and convergence to richer regions has not been happening there. Despite that, as can be seen in Figure 4.3, the services sector has been slightly increasing, especially in the last decades. However, urban migrants are clustering mostly in petty services and despite growing investments from China, there are only a few signs of a revitalisation in industry (Rodrik, 2016).

Figure 4.3: Employment in industry in Sub-Saharan Africa, share on the total employment



Note: The beginning of the time series varies across countries, depending on data availability.

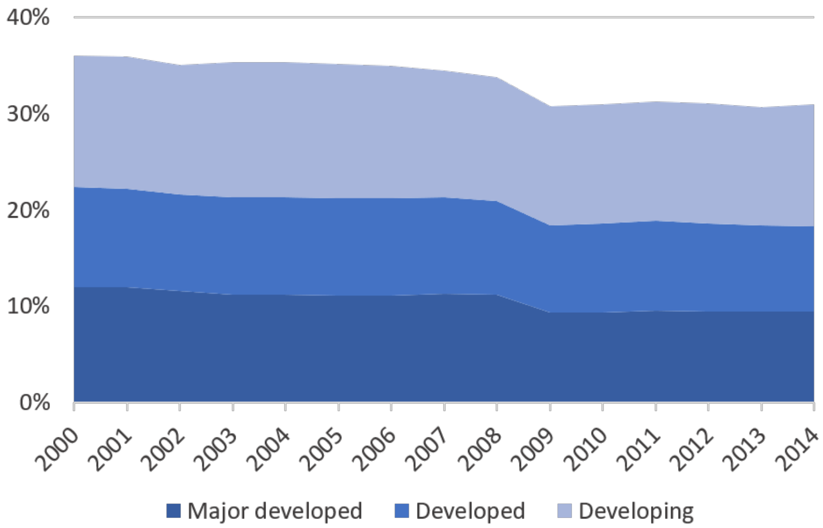
Source: Author's calculations based on data from Timmer et al. (2015).

As can be seen from direct statistics, employment in manufacturing in developing countries has been shrinking or has not even started to rise. On the contrary, the share of people employed in services continued to increase. This picture is again a bit misleading since a lot of value added in services has been generated by the final demand for manufacturing products (Figure 4.4). While the importance of manufacturing for the creation of value added in services has been decreasing slightly in major developed and developed countries (-3 and -2 pp, respectively), developing countries have experienced an increasing or at least a stable trend.[1] In 2014, almost 13% of value added was still

[1]For the classification of countries into regions, see Appendix 3.

somehow interlinked with manufacturing. We can assume that the same is true for poor African countries.

Figure 4.4: Share of value added in services generated by the final use of manufacturing products in given regions, in %



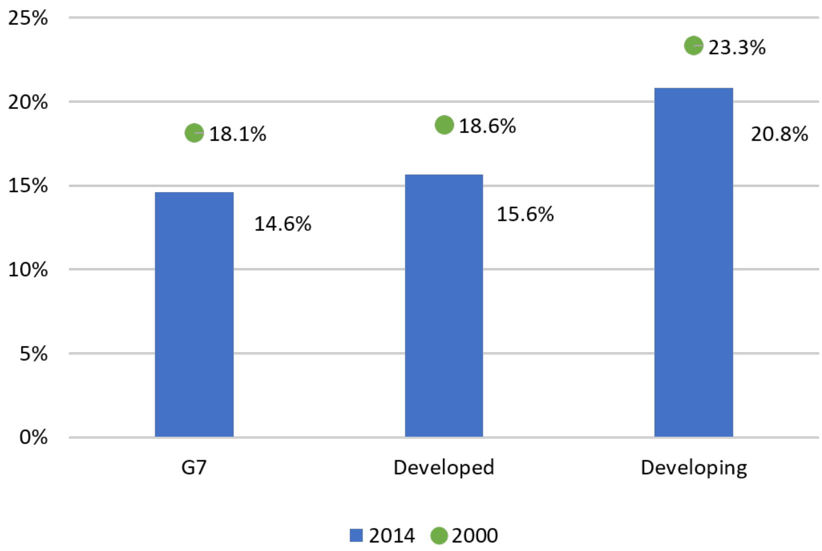
Source: Author's calculations based on data from WIOD.

4.2 Analysis of deindustrialisation in terms of VA

As discussed in 1.3, there are many ways of measuring deindustrialisation. Since we are aware of the drawbacks of these measurements in terms of value added and especially in current prices, later we will focus more on the measures for employment. However, we would like to provide some analysis regarding value added anyway, since it can bring some interesting results, too.

Between 2000 and 2014, a decreasing share of direct value added can be generally observed in manufacturing. As can be seen in Figure 4.5, the most significant decrease in the share of value added in manufacturing can be observed in the major developed – G7 countries. Throughout the observed period, it declined to 80% of the value of 2000 with the average rate of decline of 1.54%. However, the process of deindustrialisation in the major developed countries is not a new phenomenon. The developing countries have been experiencing a decrease in the relative importance of manufacturing as well. In 2014, the share of value added in manufacturing decreased to 90% of the value of 2000. In this case, the average rate of decline was 0.81%.[2] This indicates the presence of deindustrialisation in all regions throughout the period in question. Development of the process throughout the whole period can be found in Appendix 5.

Figure 4.5: Share of direct value added in manufacturing on the total value added in %

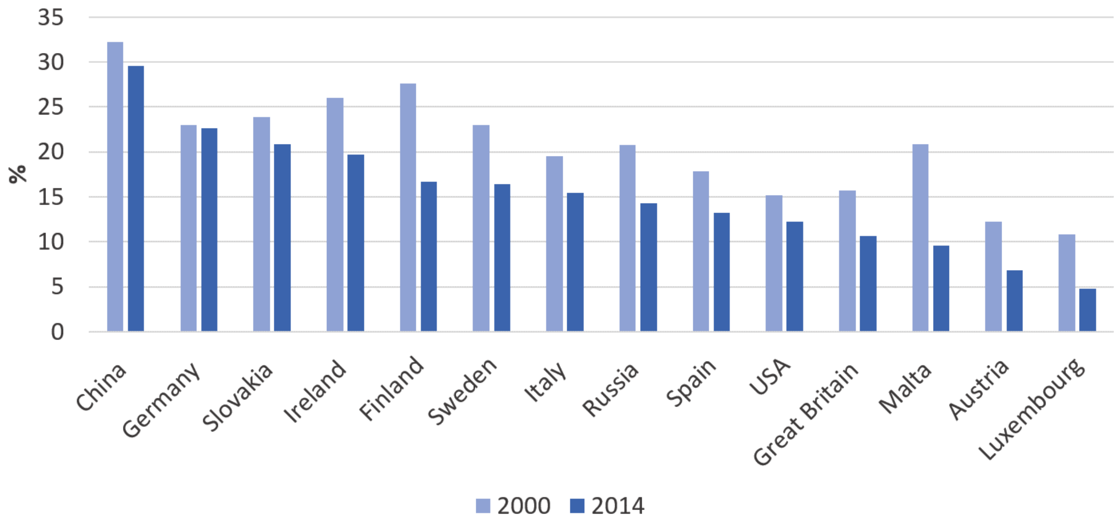


Source: Author's calculations based on data from WIOD.org.

Looking at the countries separately (Figure 4.6), even industrialised economies like Germany or a large and newly industrialised economy of China suffered from a slight decrease of the relative importance of manufacturing for the creation of value added. Moreover, there are countries in the sample, which experienced a major decline in the value added in manufacturing between 2000 and 2014. Less than or slightly above 50% of the initial share of direct value added in manufacturing was identified in Luxembourg, Malta and even in Austria. A significant change has been also observable in Finland, Great Britain, Russia, Sweden and Ireland.

[2]For a detailed view of the shares of direct value added in manufacturing on the whole value added for all countries and all years in the sample, see Appendix 7.

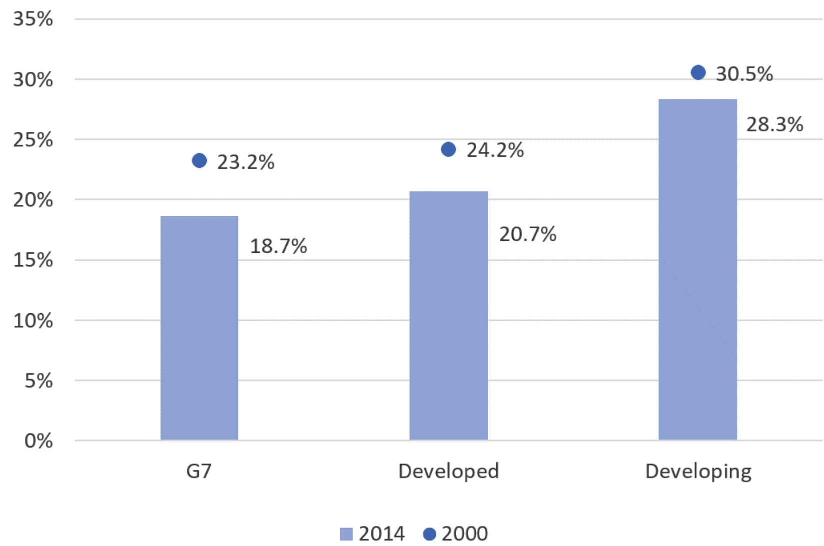
Figure 4.6: Share of direct value added in manufacturing on the total value added (in %) by countries



Source: Author's calculations based on data from WIOD.org.

When considering the indirect effects, the process of deindustrialisation is still detectable among all country groups. Moreover, it appears to be even steeper compared to the direct effects, and it is mostly true for the major developed and developed countries (Figure 4.7 and Table 4.1). This is in consistence with the results of Montresor and Vittucci Marzetti (2010) who proved it for their 'pseudo' world of OECD7 countries. Decline in the direct and indirect share was also known to The European Commission almost ten years ago, when setting a goal of achieving a 20% share of manufacturing in GDP by 2020. As can be seen later in the thesis, this can be explained by the decreasing share of outsourcing which reached its peak in major developed economies in the beginning of the new millennium. The biggest difference is observable for G7 (-4.6 pp generated effects included and -3.5 pp only for direct effects), which implies that decline in the relative importance of manufacturing is most visible among the major developed regions. However, as mentioned before, this is not a new phenomenon. What is intriguing is that this has been happening to a certain extent in the developing countries as well. In 2014, the share of value added in manufacturing decreased to 90% of the value of 2000 with the average rate of decline of 0.81% (direct effects).

Figure 4.7: Share of direct and indirect value added in manufacturing on the total value added (in %)



Source: Author's calculations based on data from WIOD.org.

From the perspective of indirect effects, the picture looks somewhat better for this group of countries, however the relative importance of manufacturing is decreasing there as well (Table 4.1). Since the data for developing countries are obtained from the WIOD database, they do not include numbers for poor African countries, countries in south Asia nor all Latin American countries. These are the regions which are still mired in poverty and when we talk about the premature deindustrialisation, we usually think of these countries. If the data were available also for this group, a decrease in the relative importance of manufacturing could be even more visible.

Concerning this development, the question of what the main drivers of these trends are arises. As mentioned in the Literature review, one of the main causes of deindustrialisation is considered to be *outsourcing*. In our thesis, following Montresor and Vittucci Marzetti (2010), it is first represented by the share of value added generated by the final demand for manufacturing products in market services.[3] The complete overview of the level of outsourcing and its development throughout the observation period 2000–2014 can be found in Appendix 9. Later, in subchapter 4.5, we deal with outsourcing in a broader context as the share of value added generated by the final demand for manufacturing products in all services and other industries except manufacturing and examine its role in G7 countries in more detail. First, as seen in Figure 4.8, the process of outsourcing has the highest magnitude in major developed countries with the average value of 20% and the highest value of 28% in Italy in 2014. The average value for the group of developed countries gained the value of about 15%. This implies that the difference between the level of outsourcing in the major developed and developed countries is notable.

Table 4.1: The speed of deindustrialisation: direct vs subsystem approach

	G7	**Developed**	**Developing**
2000	23.2%	24.2%	30.5%
2014	18.7%	20.7%	28.3%
Difference (direct + indirect)	**-4.6 pp**	**-3.5 pp**	**-2.2 pp**
2000	18.1%	18.6%	23.3%
2014	14.6%	15.6%	20.8%
Difference (direct)	**-3.5 pp**	**-3.0 pp**	**-2.5 pp**

Note: Data in the table represent the shares of direct and direct + indirect value added in manufacturing on the total value added (%) and the differences between 2000 and 2014 (percentage points).

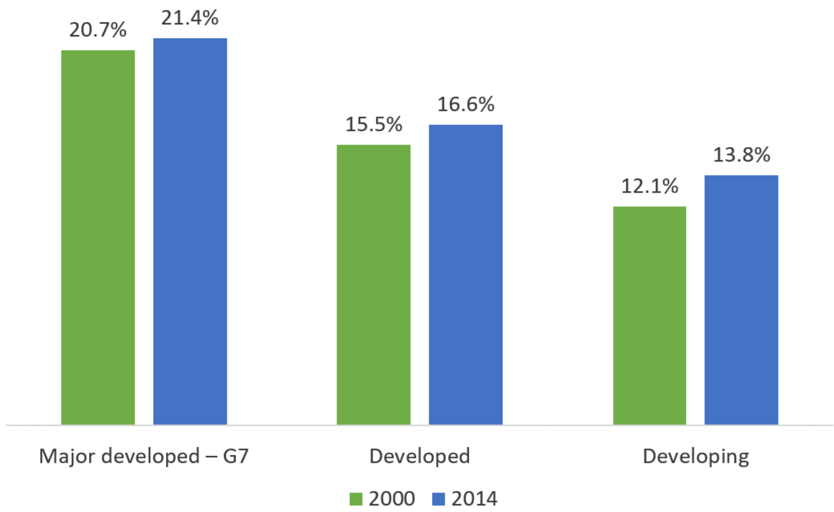
Source: Author's calculations based on data from WIOD.org.

Furthermore, on average 13% of value added was generated by the final demand for manufacturing products in market services in countries belonging to the developing ones. Apparently, there is a quite significant difference in the extent of outsourcing

[3]The classification of industries belonging to manufacturing and market services can be found in Appendix 4.

among these aggregated groups of countries and there is also a considerable difference in the average rate of change in outsourcing in manufacturing. While the average rate of change in G7 has equalled to 0.24%, the number for developing countries has been almost four times higher (0.94%). This can be considered as one of the indicators of premature deindustrialisation as well. Even though the process is generally more visible in the major developed countries, the outsourcing as a driver of deindustrialisation is significantly larger in developing economies.

Figure 4.8: Share of value added generated by the final demand for manufacturing products in market services (%)



Source: Author's calculations based on data from WIOD.org.

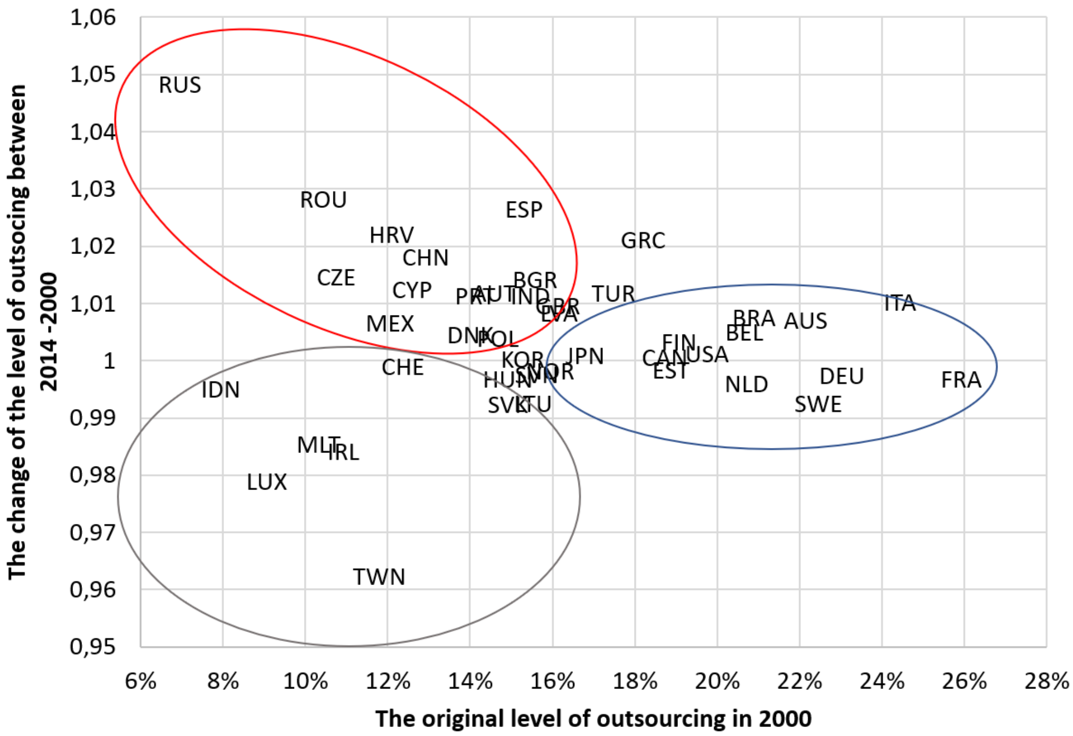
In Figure 4.9, countries are organised based on two criteria: (i) the original level of outsourcing in 2000 (the share of value added generated by the final demand for manufacturing products in market services in 2000) and (ii) the average rate of change of outsourcing between 2014 and 2000. The effects of outsourcing on value added are represented by the horizontal axis. The average value accounts for 16%. Figure 4.9 can be also vertically divided into two parts by the average rate of change equal to one. The countries lying under this value are those where the level of outsourcing decreased during the observation period and vice versa.

As can be seen, the countries with a lower original level of outsourcing converged to the level of the most developed countries in a higher pace, which is represented by the notional main diagonal (countries in the red ellipse). The countries considered to be a frontier in manufacturing, i.e. the major developed ones, are located mostly in the bottom right-hand corner (blue ellipse). This means that the level of outsourcing in manufacturing is higher in these countries, but it experienced no change or even a decrease in the observation period 2000 – 2014. A good example of that are France and Germany, both of which are a part of the major developed world and trend setters in industrial policies. In Germany, 23% of the whole value added generated by the final demand for manufacturing products is generated in the market service sectors in 2000. The share is even higher in France, 26% in particular. However, there has been a decreasing trend in outsourcing in both countries, 0.25% and 0.3% respectively on average.

The converging trend in outsourcing is visible in the upper left-hand corner (red ellipse). The countries located in this quadrant belong to those with a lower original level of outsourcing but with a higher average rate of change. The best example of that is the Russian Federation where the share of value added generated by the final demand for manufacturing products in market services accounted for less than 7% in 2000. In 2014, this share almost doubled with the average rate of change of 4.85%. During the last 15 years, another well-known newly industrialised country, China, experienced the same development. Though, one third of the whole value added is directly generated here by manufacturing, the share has slightly decreased compared to 2000. However, when also taking into account the indirect effects, the share of value added generated by the use of manufacturing products has increased, which indicates stronger linkages between manufacturing and services in the country. As shown in Figure 4.9, outsourcing has increased notably here, which suggests that the emerging industry is connecting with market services in a much faster pace. Moreover, such a connection can be directly transferred to the economy as the whole package.

Looking at the bottom left-hand corner (grey ellipse), there are two groups of countries, which can be interpreted separately. The first one consists of Slovakia, Hungary, Slovenia and Lithuania where the rate of change in time is similar to developed countries, but the magnitude of outsourcing is much lower. The shift of value added from manufacturing to services is also present in these economies, but more likely across the country's boundaries. A good example is the Slovak automotive industry where many high value-added service activities have stayed in the countries of origin (e.g. design, marketing, R&D or financial activities). For instance, the new major investment in Slovakia – Jaguar Land Rover – will probably not transfer all their high value-added services into the country. More likely, they will remain in the country of origin or they will be fragmented across several European Union countries.

Figure 4.9: The sample organised based on two criteria: the original level of outsourcing on the horizontal axis and change of outsourcing in time on the vertical axis



Source: Author's calculations based on data from WIOD.org.

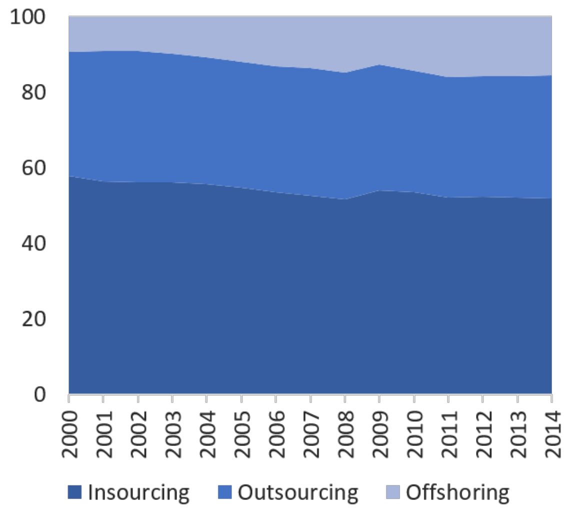
The second group of countries including Indonesia, Taiwan, Luxembourg, Malta and Ireland is quite different from the rest of the economies in this quadrant. First, in

Luxembourg, the manufacturing accounts for less than 10% of the whole value added. This implies that the manufacturing sector in Luxembourg is not so significant for the country's economy.

In Malta, there has been a significant decrease of the relative importance of manufacturing during the last 15 years. However, this process has not been caused by domestic outsourcing, since its level decreased quite significantly as well. In Ireland, when looking at the direct value added generated in industry, it decreased in 2014 to 75% of the value of 2000 (from above 26% to only 19%). This could indicate the decrease of the relative importance of manufacturing for the country's economy throughout the years in question. The development of manufacturing in Taiwan is quite unusual. This country belongs to the group of newly industrialised countries where the share of value added generated by the final demand for manufacturing products has increased directly and also indirectly. However, the level of outsourcing has decreased quite significantly which may indicate that the interconnection between manufacturing and services is not yet developed in the country.

After all, it seems that outsourcing as one of the drivers of the observed deindustrialisation plays a major role mostly in developing countries. Therefore, in the next part of the thesis, we examine what factors cause the decrease of the relative importance of manufacturing in major developed economies. The hypothesis is that deindustrialisation in major developed countries is mostly driven by *offshoring*. For this purpose, we use the subsystem approach focused on the internationally fragmented production structures. Thus, using the inter-country input-output model, we find that more than 50% of value added in manufacturing in G7 is still generated by the final demand for manufacturing products in G7.

Figure 4.10: Structure of value added generated by the final demand for manufacturing products in G7, in %



Source: Author's calculations based on data from WIOD.org.

Next, 32.4% of value added in manufacturing in G7 was generated by the final demand for manufacturing products in G7 in services and other industries, i.e. by outsourcing. Thus, the process of outsourcing is still strong in the major developed world but it reached its limits two decades ago. On the contrary, the offshoring can be considered as a key driver of deindustrialisation for this period (Figure 4.10).

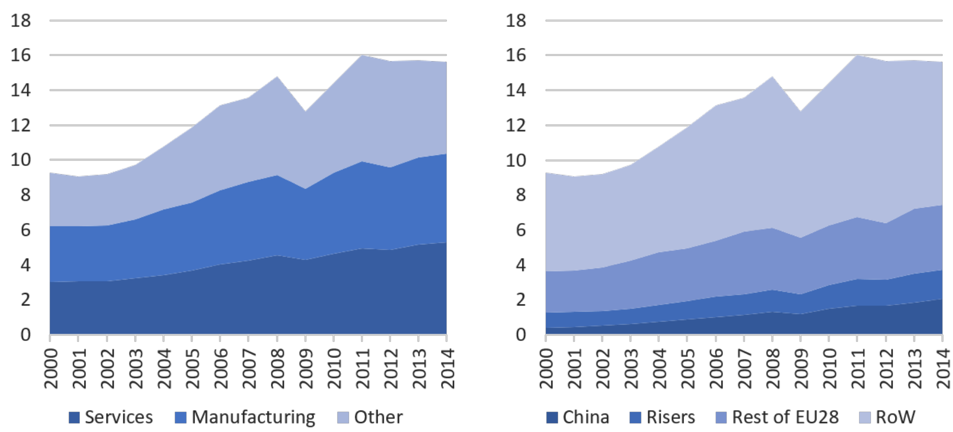
As seen in Table 4.2 and also graphically in Figure 4.11, offshoring increased by roughly 7 pp compared to 2000. A large part of the overall value added generated by the final demand for manufacturing products in G7 has been generated in services and other industries abroad, mostly in other developed economies. Quite a significant part of the increase in offshoring was generated by the increased 'shift' of activities interlinked with manufacturing towards China and the so-called risers (India, Indonesia, Korea, Poland and Turkey) as well, especially after the crisis in 2009. However, as has been previously mentioned, in terms of value added, there is still a significant part of the offshoring connected to the rest of the world (RoW), in particular to developed economies with a higher productivity of labour. Again, we showed that the direct picture of deindustrialisation may be misleading and there are still many activities that depend directly or indirectly on manufacturing.

Table 4.2: Offshoring under the G7 manufacturing subsystem by industries and regions, value added, in %

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	14-00
Offshoring	9.3	9.0	9.2	9.7	10.8	11.9	13.1	13.6	14.8	12.8	14.4	16.0	15.7	15.7	15.6	**6.4**
Services	3.0	3.1	3.1	3.2	3.4	3.7	4.0	4.2	4.6	4.3	4.6	4.9	4.9	5.2	5.3	**2.3**
Manufacturing	3.2	3.2	3.2	3.4	3.7	3.9	4.2	4.5	4.6	4.1	4.6	5.0	4.7	5.0	5.1	**1.9**
Other	3.1	2.8	2.9	3.1	3.6	4.3	4.9	4.8	5.7	4.4	5.1	6.1	6.1	5.6	5.3	**2.2**
Risers + China	1.3	1.3	1.4	1.5	1.7	1.9	2.2	2.3	2.6	2.3	2.8	3.2	3.1	3.5	3.7	**2.4**
China	0.4	0.4	0.5	0.6	0.7	0.9	1.0	1.1	1.3	1.2	1.5	1.7	1.7	1.9	2.1	**1.6**
Risers	0.9	0.9	0.8	0.9	1.0	1.1	1.2	1.2	1.3	1.2	1.4	1.5	1.5	1.6	1.7	**0.8**
RoW	8.0	7.7	7.8	8.3	9.1	9.9	10.9	11.2	12.2	10.4	11.6	12.8	12.5	12.2	11.9	**3.9**

Source: Author's calculations based on data from WIOD.org.

Figure 4.11: Offshoring under the G7 manufacturing subsystem by industries and regions, 2000 - 2014, in %



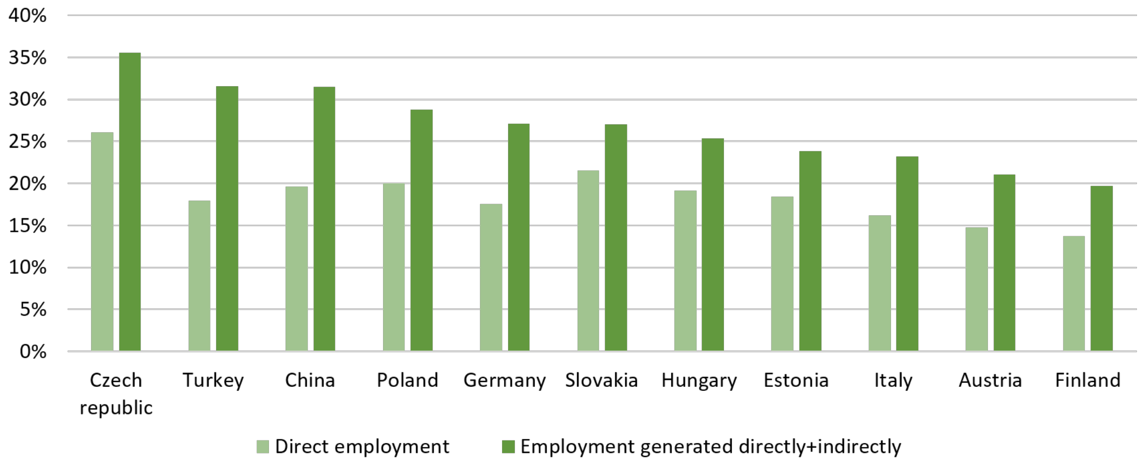
Source: Author's calculations based on data from WIOD.org.

4.3 Employment deindustrialisation

According to some authors (e.g. Rodrik, 2016), deindustrialisation is particularly noticeable when looking at the manufacturing employment share. For instance, considering the structure of employment in EU28 in 2014, almost 75% of people were employed in services, compared to only 16% of people working in industry, out of which around 14% worked directly in manufacturing. In 2000, 66% of people were working in services and 20% in industry, out of which 18% in manufacturing. Thus, we will shift our focus on employment calculations in the following part of the thesis. Moreover, the results for employment are better comparable between countries in comparison with value added, which was discussed in 1.3.

First, we demonstrate why it is important to take employment interconnected with manufacturing into consideration as well and then examine deindustrialisation from this perspective, too. As shown in Figure 4.12, while the direct employment in manufacturing, except for the Czech Republic and Slovakia, is well below 20%, the employment generated by the final use of manufacturing products is much higher. Employment generated directly and indirectly is above 30% in the Czech Republic, Turkey and China, which implies that approximately every third employee is directly or indirectly generated by the final use of manufacturing products in these countries. Even when looking at Finland, where the direct employment in industry is quite low, almost every fifth job is created by the final use of manufacturing products. Thus, the importance of industry for creating new jobs is definitely not negligible. Simple statistics cannot reveal such linkages; however, they are really important from the national economic viewpoint. A significant part of the services sector would not be created if it was not for a well-functioning manufacturing. This should be considered when talking about deindustrialisation and the decreasing importance of industry for the development of economies.

Figure 4.12: Direct and complex employment generated by manufacturing, % of total employment, 2014

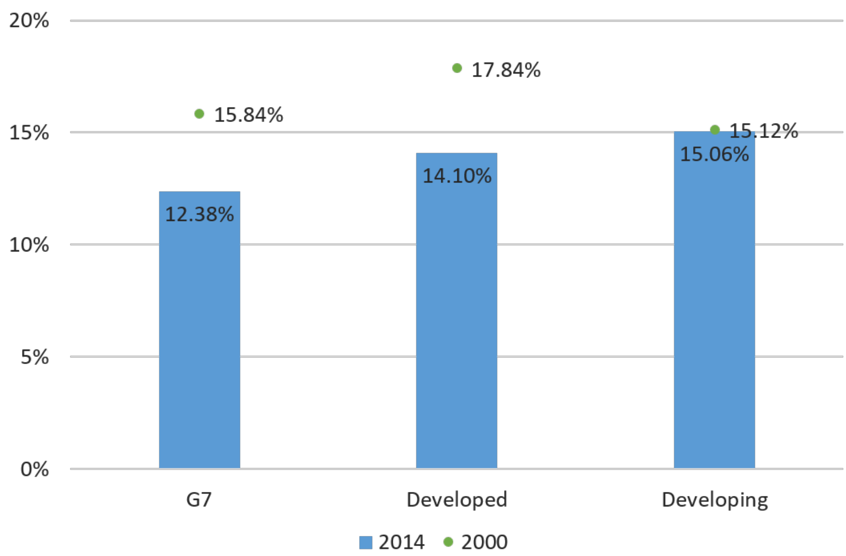


Source: Author's calculations based on data from WIOD.org.

Looking at the regions [4], we can see that the so-called deindustrialisation is even more visible compared to the value added indicator. The share of people directly employed in manufacturing fell by 3.5 pp in the G7 group and by 3.8% in the group of developed countries. Here, developing countries did not experience such a decline as in the case of value added. The main reason for this can be found in the composition of the group. It consists of only seven countries and in most of them there has been in fact an increase (China and India) or no change (Indonesia, Turkey and Taiwan) in manufacturing employment. As mentioned also in Baldwin (2016), there are few (initially) lower productive countries (China and the so-called risers - Korea, India, Indonesia, Thailand, Turkey and Poland) where has been a rapid industrialisation process since the 1990s. The manufacturing employment is in actual shifted and concentrated there at the expense of the major developed countries. The picture would be different if also poor African, Asian or all Latin American countries were included, too (see Figure 4.13).

[4]The aggregation of countries follows the country classification of the United Nations and is provided in Appendix 3

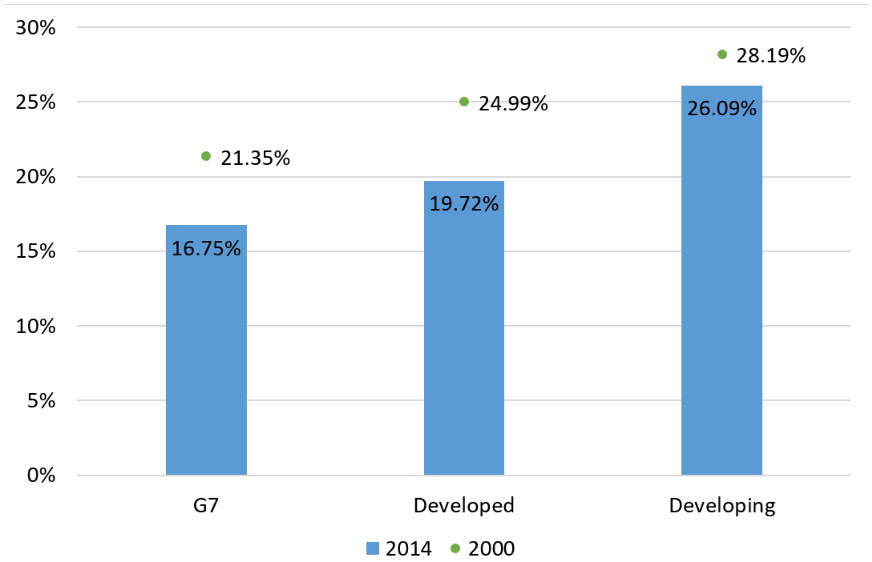
Figure 4.13: Share of direct employment in manufacturing on the total employment (in %)



Source: Author's calculations based on data from WIOD.org.

Again, considering also the indirect effects, the decline in manufacturing appears even steeper (Table 4.3). In this case, the difference is the largest for developed countries (-5.3 pp) and then for the G7 group (-4.6 pp). As in the case of value added, the peak of outsourcing of economic activities to industries outside manufacturing was reached almost two decades ago in developed economies. Therefore, we can see a decline in generated manufacturing employment, as well. The share of total people employed in manufacturing decreased in all of them except of China and India. All economies in G7 experienced a decline in manufacturing employment share, with the highest one in Great Britain (more than 9 pp). The same is true for developed countries with the exception of the Czech Republic (increase of almost 4 pp). In the later parts of the thesis, we will try to define the drivers of these changes.

Figure 4.14: Share of direct and indirect employment in manufacturing on the employment (in %)



Source: Author's calculations based on data from WIOD.org.

Table 4.3: The speed of deindustrialisation: direct vs subsystem approach (employment)

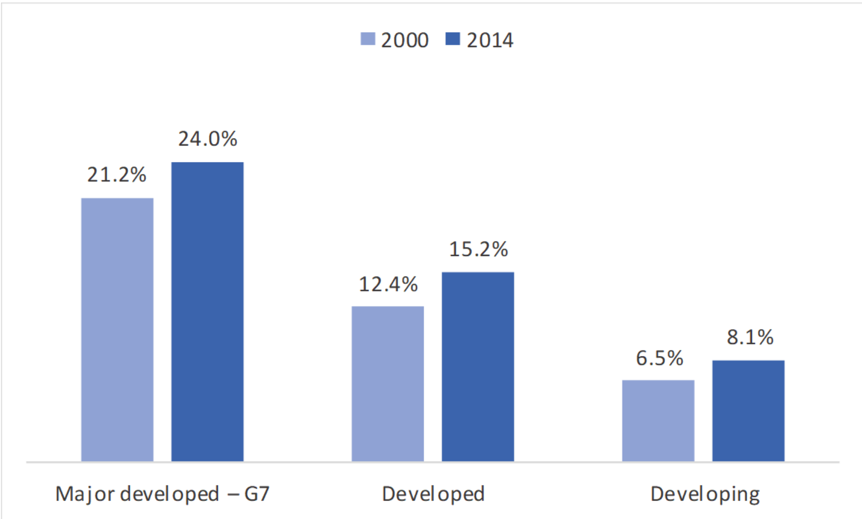
	G7	**Developed**	**Developing**
2000	21.35%	24.99%	28.19%
2014	16.75%	19.72%	26.09%
Difference (direct + indirect)	**-4.6 pp**	**-5.3 pp**	**-2.1 pp**
2000	15.84%	17.86%	15.12%
2014	12.38%	14.1%	15.06%
Difference (direct)	**-3.5 pp**	**-3.8 pp**	**-0.1 pp**

Note: Data in the table represent the shares of direct and direct + indirect employment in manufacturing on the total employment (%) and the differences between 2000 and 2014 (percentage points).

Source: Author's calculations based on data from WIOD.org.

Next, outsourcing from an employment point of view is represented by Figure 4.15. Compared to value added, we can see a higher level of outsourcing in the major developed and developed economies with even higher average rates of changes. However, the highest average rate of increase (of 1.67%) has been again detected in the group of developing countries, which confirms that outsourcing as one of the drivers of deindustrialisation plays a bigger role in a developing world. This also implies that some other factors contribute to the decrease of a relative importance of manufacturing in developed economies (e.g. offshoring, reshoring or other factors).

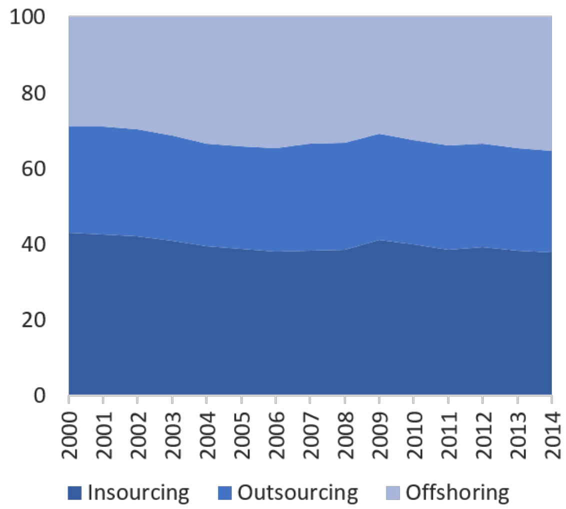
Figure 4.15: Share of employment generated by the final demand for manufacturing products in market services (%)



Source: Author's calculations based on data from WIOD.org.

Therefore, in the following lines, we analyse offshoring as a potential driver of deindustrialisation in major developed countries. As in the case of value added, we use the multi-regional input-output model which captures flows between 44 regions and 56 industries. Compared to value added, outsourcing and offshoring are of much higher importance in the case of employment. While the so-called insourcing (the share of employment in manufacturing in G7 generated by the final demand for manufacturing products in G7) and outsourcing (the share of employment in non-manufacturing industries in G7 generated by the final demand for manufacturing products in G7) declined between 2000 and 2014, in particular by 5.2 and 1.3 percentage points, respectively, the offshoring increased significantly.

Figure 4.16: Structure of employment generated by the final demand for manufacturing products in G7, in %



Source: Author's calculations based on data from WIOD.org.

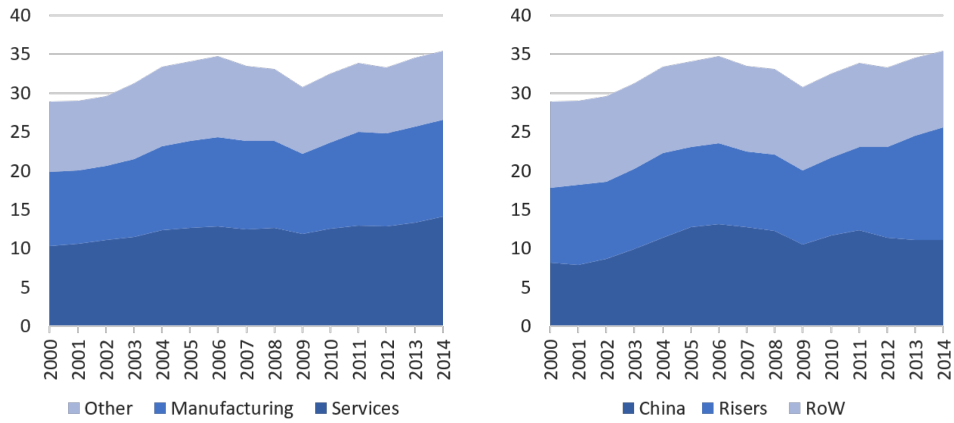
As seen in Table 4.4 and Figure 4.17, this applies mainly to the offshoring of services but also the offshoring within manufacturing itself. In 2014, 14% of employment generated by the final demand for manufacturing products in G7 was generated in services abroad and 12% in 'foreign' manufacturing. In contrast with value added, most of the 'foreign' employment connected to the final demand for manufacturing products in G7 was generated in China and the risers (India, Indonesia, Korea, Poland and Turkey). These are the countries with much lower productivity levels compared to major developed economies (in many cases only 20 to 25% of their productivity levels), so the offshoring of activities interlinked with manufacturing to these countries is more visible concerning employment.

Table 4.4: Offshoring under the G7 manufacturing subsystem by industries and regions, employment, in %

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	14-00
Offshoring	28.9	29.0	29.5	31.2	33.4	34.1	34.7	33.5	33.1	30.7	32.5	33.9	33.3	34.5	35.4	**6.5**
Services	10.4	10.7	11.1	11.5	12.4	12.7	12.8	12.5	12.7	11.9	12.6	13.0	12.9	13.3	14.1	**3.7**
Manufacturing	9.5	9.4	9.5	10.1	10.8	11.2	11.5	11.4	11.2	10.3	11.1	12.1	11.9	12.4	12.5	**3.0**
Other	9.0	9.0	8.9	9.7	10.2	10.3	10.4	9.6	9.2	8.6	8.8	8.8	8.5	8.8	8.8	**-0.2**
Risers + China	17.8	18.2	18.6	20.2	22.2	23.0	23.6	22.5	22.1	20.1	21.7	23.1	23.0	24.5	25.6	**7.8**
China	8.2	7.9	8.7	10.0	11.4	12.7	13.2	12.8	12.3	10.5	11.6	12.4	11.4	11.2	11.1	**2.9**
Risers	9.6	10.2	9.9	10.3	10.9	10.3	10.4	9.7	9.8	9.6	10.1	10.8	11.7	13.4	14.5	**4.9**
RoW	11.1	10.8	11.0	11.0	11.1	11.1	11.1	11.0	11.0	10.6	10.7	10.7	10.3	10.0	9.8	**-1.3**

Source: Author's calculations based on data from WIOD.org.

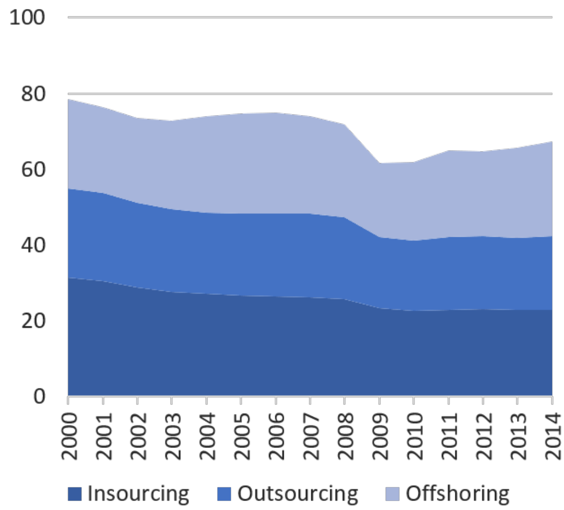
Figure 4.17: Offshoring under the G7 manufacturing subsystem by industries and regions, employment, in %



Source: Author's calculations based on data from WIOD.org.

This is also apparent in absolute terms, i.e. looking at the total number of people from different industries that is necessary to satisfy the final demand for manufacturing products in G7. More than 18 million people employed in China and 'rapid risers' are directly or indirectly connected to the final demand for manufacturing products in major developed economies, which is an increase of 3.4 million compared to the beginning of 2000. Overall, more than one third of people directly and indirectly working for manufacturing in G7 is related to offshoring, mostly to risers and China (Figure 4.18 and 4.19). Again, this trend is very much observable after the 2009 crisis and it has been accelerating in the most recent years. As seen in Figure 4.18, insourcing and outsourcing are slowly decreasing, while the value for offshoring is rising every year. The complete development of Offshoring under the G7 manufacturing subsystem by industries and regions expressed in millions of people can be found in Table 4.5.

Figure 4.18: Structure of employment generated by the final demand for manufacturing products in G7, in millions of people



Source: Author's calculations based on data from WIOD.org.

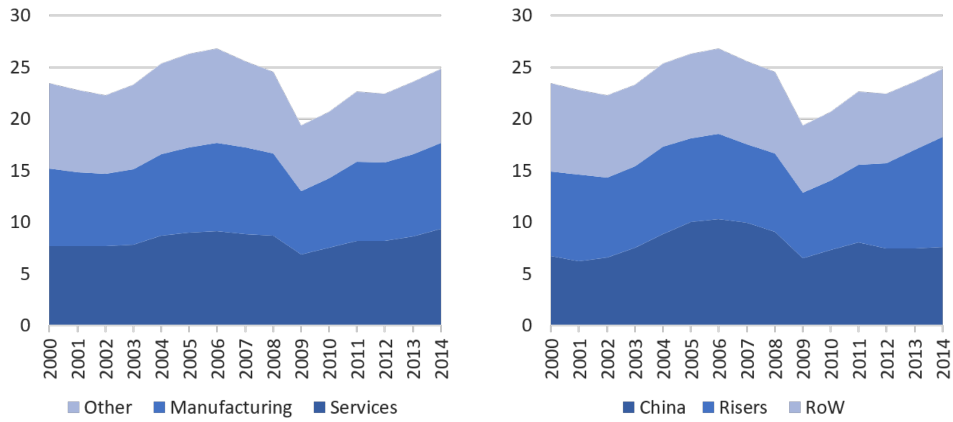
In absolute terms, offshoring of services is the most visible with the undeniable dominance of risers and China. These are the countries which are lower productive compared to major developed economies (often even four times lower), so the generated effects in terms of employment are more prominent compared to value added. Repeatedly, we observe that deindustrialisation is more visible in employment. However, still a lot of activities in services and other industries, either in home countries or abroad, are somehow connected to manufacturing.

Table 4.5: Offshoring under the G7 manufacturing subsystem by industries and regions, employment in millions

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	14-00
Offshoring	23.4	22.8	22.3	23.3	25.3	26.2	26.8	25.5	24.5	19.3	20.7	22.7	22.4	23.6	24.8	**1.4**
Services	7.7	7.7	7.7	7.8	8.7	9.0	9.2	8.8	8.7	6.9	7.5	8.2	8.2	8.6	9.4	**1.7**
Manufacturing	7.5	7.2	7.0	7.3	7.9	8.3	8.5	8.4	8.0	6.1	6.7	7.7	7.6	7.9	8.3	**0.8**
Other	8.3	7.9	7.6	8.1	8.7	9.0	9.1	8.3	7.9	6.3	6.4	6.8	6.7	7.0	7.2	**-1.1**
Risers + China	14.9	14.6	14.3	15.4	17.3	18.1	18.5	17.5	16.7	12.9	14.0	15.6	15.7	17.0	18.3	**3.4**
China	6.7	6.2	6.6	7.5	8.8	10.0	10.3	9.9	9.1	6.5	7.3	8.1	7.5	7.4	7.6	**0.9**
Risers	8.2	8.4	7.8	7.9	8.4	8.1	8.2	7.6	7.6	6.3	6.7	7.5	8.2	9.6	10.6	**2.5**
RoW	8.6	8.2	8.0	7.9	8.1	8.1	8.2	8.0	7.9	6.4	6.6	7.1	6.7	6.5	6.5	**-2.0**

Source: Author's calculations based on data from WIOD.org.

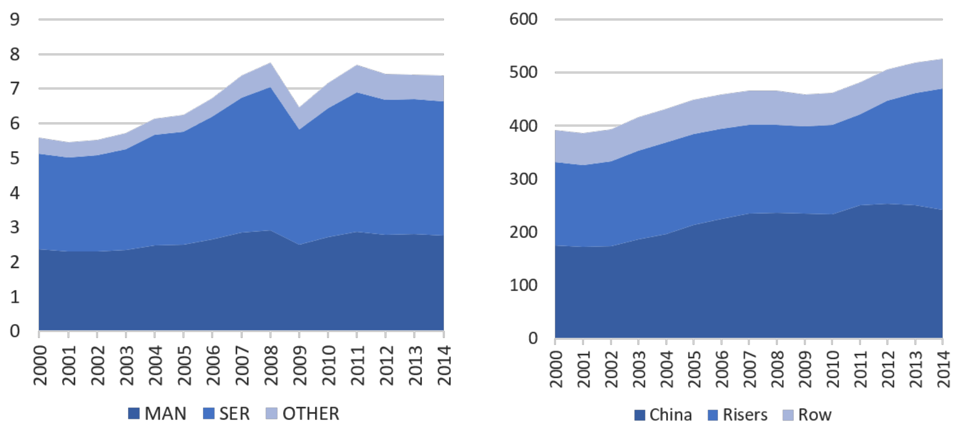
Figure 4.19: Offshoring under the G7 manufacturing subsystem by industries and regions, employment in millions of people



Source: Author's calculations based on data from WIOD.org.

As mentioned in the methodology of the subsystem approach, in a situation of internationally fragmented production structures, countries can benefit from the participation in manufacturing subsystems of other regions. This is especially relevant in a situation of rising final demand for manufacturing products in fast growing economies. We examined the participation of major developed countries, China, 'Rapid risers' and the RoW in the global final demand for manufacturing products. Looking at Figure 4.20 we can see that the participation of G7 in the global increase in employment in manufacturing is quite small compared to other regions. Major developed economies grasped only a tiny share in terms of generated value added and employment. The integration of G7 to global final demand for manufacturing outside G7 increased mainly in services, by 1.1 million. The total growth reached 1.8 million. At the same time, China and risers contributed to global manufacturing employment significantly. The increase amounted to 72 and 67 million jobs, respectively. Thus, the source of relatively poor performance of manufacturing in G7 was also in their idle participation in the completion of final products consumed in the rest of the world (Figure 4.20 and Table in Appendix 20).

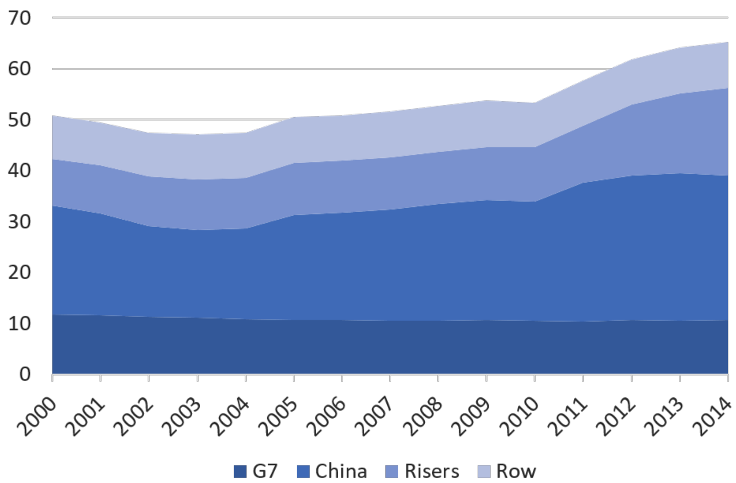
Figure 4.20: Participation of G7 and other regions in the global final demand for manufacturing products, in millions of people



Source: Author's calculations based on data from WIOD.org.

When looking at the issue from a slightly different angle, we can also examine the integration of manufacturing in service subsystems of different regions, i.e. to calculate the employment generated in G7, China, Risers and RoW by the global final demand for services. As seen in Figure 4.21, in general, the amount of labour in manufacturing generated under the service subsystems increased by almost 15 millions. Employment in manufacturing in G7 induced by the global final demand for services was quite stable, with a minor decrease of about one million. On the other hand, integration of manufacturing in the final demand for services increased in other regions, most notably in rapid risers. The highest number of jobs is however still generated in Chinese manufacturing. In 2014, it was more than 28 million, which represented 44% of employment expressed in equation 3.12. Number of people employed in manufacturing in risers under the service subsystem increased by more than 8 million since 2000 and reached the value of 17.2 million in 2014. To sum up, the share of manufacturing in the service subsystem did not increase dramatically and in the case of G7 countries, we can even observe a decrease.

Figure 4.21: Employment in manufacturing generated by the global final demand for services, in millions of people



Source: Author's calculations based on data from WIOD.org.

Employment deindustrialisation by skill groups

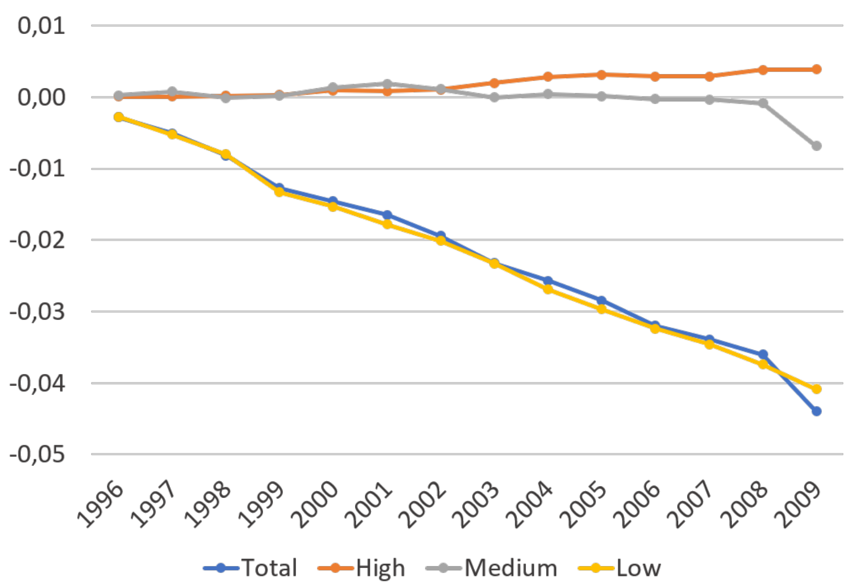
As shown above, deindustrialisation is in its strongest form when looking at the employment. Only few countries with a strong comparative advantage in manufacturing have been able to avoid a steady decline in manufacturing employment throughout the recent years. Following Rodrik (2016) and using the Socio-Economic Accounts of the WIOD Timmer (2012), we were able to look deeper at the employment impacts.

Manufacturing employment data are divided here into three worker types: low-skill, medium-skill and high-skill. These data cover the years 1995 – 2009 and include 40 countries, mostly the European ones. When following Rodrik's basic specification:

$$manshare_{it} = \beta_0 + \beta_1(lnpop_{it}) + \beta_2(lnpop_{it})^2 + \beta_3(lny_{it}) + \beta_4(lny_{it})^2 + \alpha_i + p_t + \epsilon_{it} \tag{4.1}$$

controlling for the effect of demographic and income trends (with quadratic terms for log population – pop, and GDP per capita – y) as well as country fixed effects (α_i) and take the share of manufacturing on the total employment by skill groups as a dependent variable (manshare), only a minority of countries managed to avoid a decline in manufacturing employment. Country fixed effects allow one to consider all country specific features that create different conditions for manufacturing industries among different countries. We also use the annual dummies for the 1995 to 2009 data (p_t). This gives us three regressions, one for each skill type.

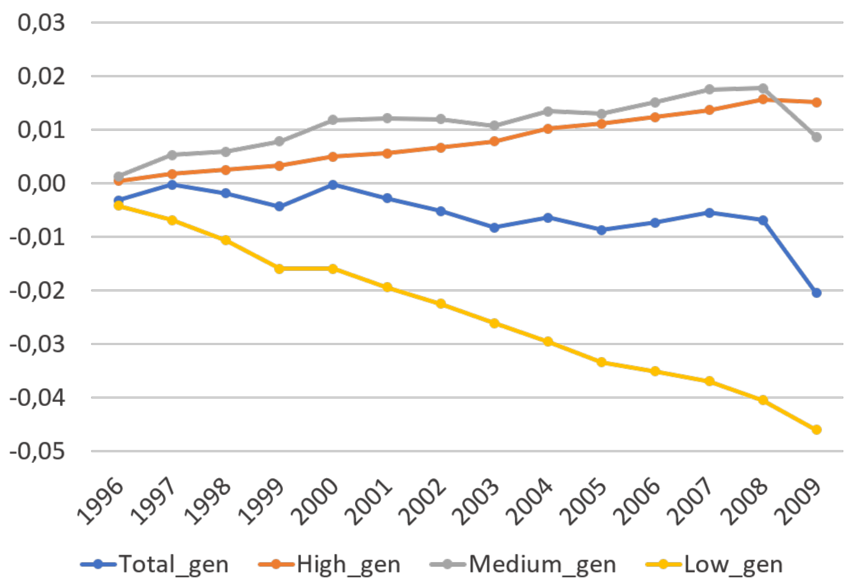
Figure 4.22: Share of employment generated by the final demand for manufacturing products in market services (%)



Source: Author's calculations based on Rodrik (2016) and data from WIOD.org.

It is shown in Figure 4.22, that the decline is strongest when looking at low-skill employment, which has come down significantly between 1995 and 2009. Moreover, it accounted for almost the entire reduction in employment over time and the result is statistically highly significant. A decline in medium-skill workers is only subtle when comparing to the low-skill workers, with a more major change between 2008 and 2009. On the contrary, the manufacturing's share of a high-skill group has even slightly increased over the period in question. However, when we use the generated effects (the direct and indirect share of manufacturing on the total employment by skill groups) as a dependent variable, the overall deindustrialisation appears much slower in the period of 1996 - 2009 (see Figure 4.23).

Figure 4.23: Estimated year coefficients for employment of different skill groups – direct effects



Source: Author's calculations based on Rodrik (2016) and data from WIOD.org.

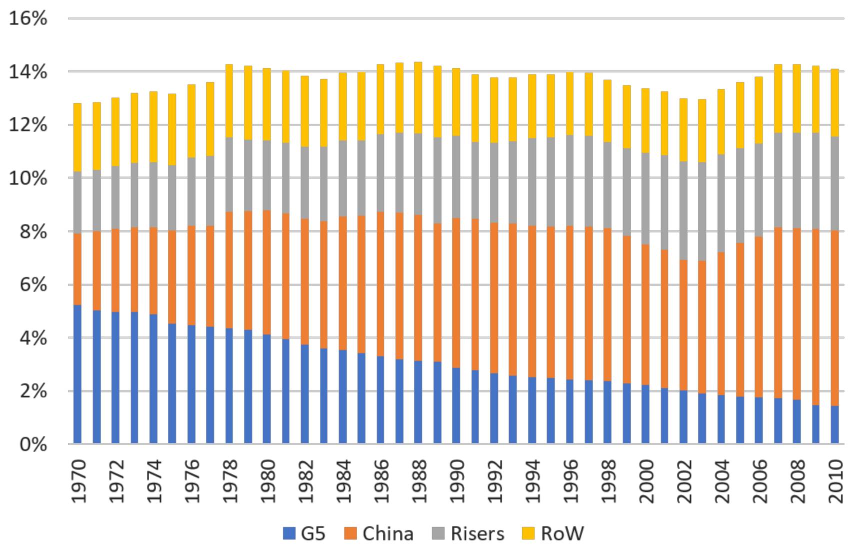
Similarly to direct effects, it is driven by low-skill workers but here it is significantly slowed down by the positive effects of medium and high-skilled employment generated indirectly. Thus, we can see that the shift towards medium and high skill labour can mitigate the threat of a deindustrialisation.

4.4 A global perspective of deindustrialisation

Since many authors suggest that from a 'global' viewpoint, the picture looks somewhat different and there is rather a continual shift in the location of manufacturing jobs than actual deindustrialisation, we look at the issue from this perspective as well. For instance, especially Felipe and Mehta (2016) argue that these trends must be examined at a global context. Constructing a dataset on manufacturing employment for 64 countries (accounting for 82% of the world's population) and calculating the manufacturing sector's share of global employment over time, they have found some interesting results. From 1970 to 2010, the global manufacturing employment share remains almost constant, at 14% of global employment in particular. The same development holds for the value added indicator, which is contradictory with declines at national levels. One can explain it by the theory that the competition from populous lower-income countries increases and causes a shift in the location of manufacturing jobs. In particular, European countries and North Africa lost approximately as many jobs in manufacturing as China and South Asia gained. The similar idea has been presented by Baldwin (2016), according to whom, China and '6 risers' increased their world manufacturing shares at the expense of G7 countries. Also Haraguchi et al. (2017) contributed to the topic, saying that the decline in both manufacturing value added and employment shares in many countries has not been caused by changes in the manufacturing sector's development potential, but mostly by a strong concentration of manufacturing activities in small number of mainly large developing economies. For a more detailed description of the topic, see 1.2.

Regarding this issue, we used the GGDC employment data (available for 41 countries and West Germany, which was however excluded from our database due to reunification of Germany) to compute the share of persons employed in manufacturing in given regions in total - 'global' - employment. The trend of no deindustrialisation at a 'global' context is visible in Figure 4.24. These results are similar of those in Felipe and Mehta (2016). First, we can notice, that the share of manufacturing in total employment has even slightly increased compared to 1970 and reached the value of about 13% in 2010. Second, there is a clear shift from manufacturing employment in G5 to China and 'risers'.[5] Finally, looking at the rest of the countries (RoW), we can see a constant and a slightly decreasing trend in global manufacturing employment, so a hint of premature deindustrialisation.

Figure 4.24: Share of manufacturing in 'global' employment with regional contributions



Source: Author's calculations based on the GGDC data Timmer et al. (2015).

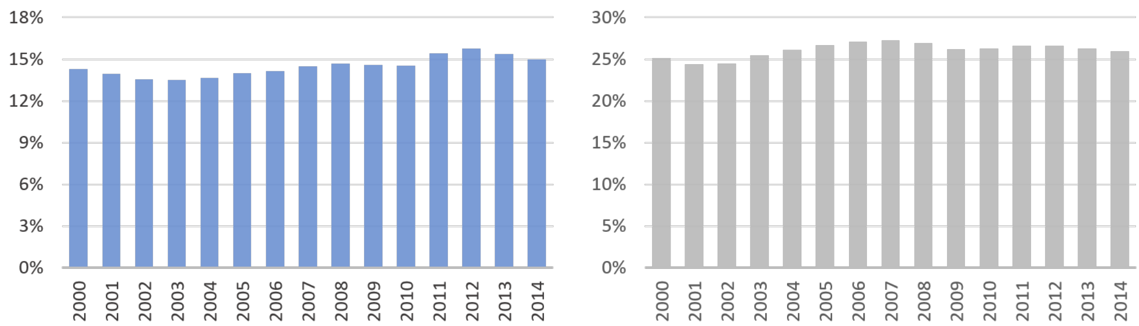
Next, we wanted to find out if this trend is also visible when considering the whole manufacturing employment, it means also the employment which is indirectly connected to manufacturing. In this case, we could not use such a long time series, since the WIOD data are available from 2000. In Figure 4.25, we can see the share

[5] The G5 group consists of France, Great Britain, Italy, USA and Japan. Data for Canada and Germany were not available. We used the group of risers as proposed by Baldwin (2016), so it includes India, Indonesia, Korea and Thailand. Data for Poland and Turkey were not available. RoW consists of the rest of the countries in the database, namely 11 Sub-Saharan countries (Botswana, Ethiopia, Ghana, Kenya, Malawi, Mauritius, Nigeria, Senegal, South Africa, Tanzania, and Zambia), 2 Middle East and North African countries (Egypt, Morocco), 5 Asian countries (Hong Kong, Malaysia, Philippines, Singapore and Taiwan), 9 Latin American countries (Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Mexico, Peru, Venezuela) and 4 European countries (West Germany, Denmark, Spain, the Netherlands and Sweden)

of direct and direct and indirect manufacturing employment in a global perspective. Again, we witness quite a constant development, with higher values when considering also the indirect effects. The share of total manufacturing employment is approximately 15% for direct and 25% for indirect effects. In the latter case, the average rate of change has been even lower. Looking at the absolute number of persons employed in manufacturing together in all countries in the sample, it increased by 2% on average over the 15 years.

It is good to be aware of this global perspective, so we can see a complete picture of the structural trends in play. Supply chains which formerly involved richer economies has been changing and now run more through populous and initially lower productive economies. This means that manufacturing jobs are more thinly distributed and individual countries have difficulties to sustain high levels of manufacturing employment, which has been also stressed in Felipe and Mehta (2016). Therefore, it is still worth examining the trend of deindustrialisation at within countries levels.

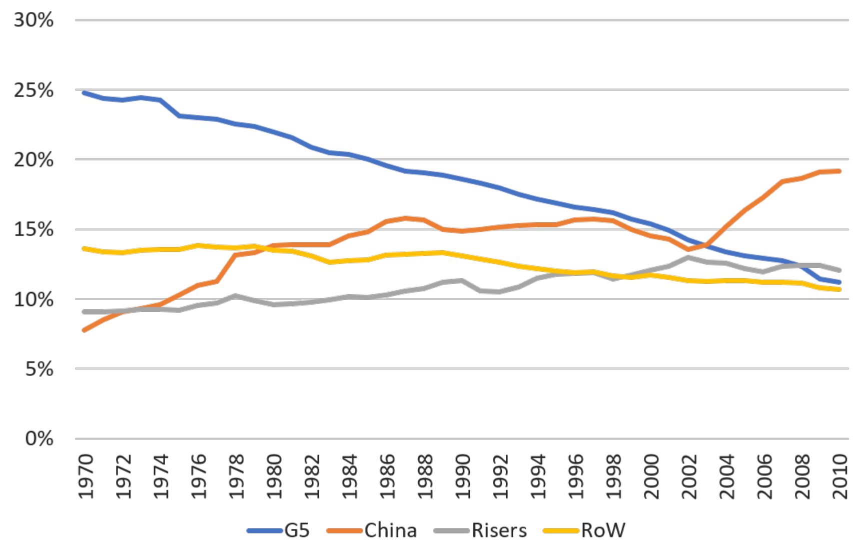
Figure 4.25: Share of direct and direct and indirect manufacturing in 'global' employment



Source: Author's calculations based on the data from WIOD.org.

The trend of shifting the manufacturing jobs from richer to lower productivity regions is also captured in Figure 4.26. In this case, we looked at the domestic manufacturing employment shares for 4 regions into more detail. The shares are calculated as people employed in manufacturing in a particular region on the total employment of the given region. The composition of individual country groups is explained above in this section. Declining share of manufacturing employment is most visible in the G5 group, from 25% in 1970 to 12% in 2010. Meanwhile in China, the share of manufacturing employment has more than doubled, with even steeper increase from 2003. There has been also a shift of manufacturing jobs towards the so-called risers. Together with China, they managed to double the share of people working in manufacturing (from 8% to 16%). Again, the presence of deindustrialisation is detectable, especially from the beginning of the 1990s.

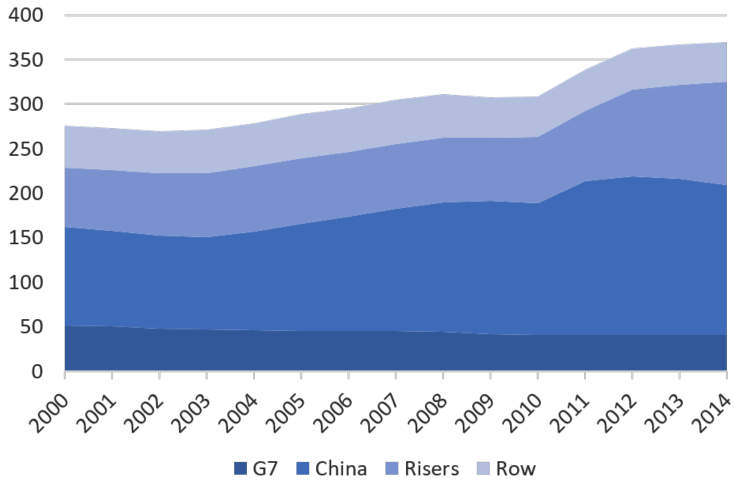
Figure 4.26: Domestic manufacturing employment shares, share of total domestic employment in %



Source: Author's calculations based on the GGDC data Timmer et al. (2015).

When it comes to global manufacturing employment in absolute terms, it has increased quite significantly since 2000, by roughly 94 million jobs. We also observe a clear shift from manufacturing employment in major developed countries to China and risers (India, Indonesia, Korea, Thailand, Poland and Turkey). The number of people employed in manufacturing in China increased by almost 58 million, while in G7, a decrease of almost 11 million of jobs was documented. Looking at the manufacturing employment share from the global point of view, we can see that the share has been quite constant throughout the whole period, with even a slight increase in the last few years (Figure 4.27 below and Table in Appendix 19).

Figure 4.27: Global direct manufacturing employment, in millions of people



Source: Author's calculations based on data from WIOD.org.

Figure 4.27 shows the observed deindustrialisation in G7 countries and in the rest of the world. But the increased manufacturing employment in China and risers more than compensated for the decline. Manufacturing employment is linked to the subsystem approach in Equation 3.9.

4.5 Structural decomposition analysis: Results

Structural decomposition analysis represents a way of determining major sources of changes in an economy. Therefore, it can be a good tool for identifying potential drivers of the so-called deindustrialisation. Since the input-output analysis enables us to quantify also the indirect employment connected to manufacturing, we were able to decompose the changes in the overall manufacturing employment. Because of the inconsistency of the data from different releases, we provide a decomposition analysis in three version: *(i) SDA of changes in the overall manufacturing employment for 1995 - 2009 in constant prices, (ii) SDA of changes in the overall manufacturing employment* *for 1995 - 2009 in current prices* and *(iii) SDA of changes in the overall manufacturing employment for 2000 - 2014 in current prices.*

First of all, it should be recalled that the data from different releases are not comparable, as mentioned and explained in the Data section (3.4). Even though both versions contain the same type of data and tables and are constructed using the same methodology, major improvements and extensions make the comparison impossible. As can be seen in Table 4.6, the new release has already reflected the changes in the reorganisation of production processes and various activities have been disaggregated into more industries. The major shifts were mainly done from manufacturing to services (e.g. a shift from manufacturing to various auxiliary activities to services etc.), i.e. the early signs of outsourcing are visible even from the direct statistics. For instance, in 2007 (the most recent year from the older release not yet affected by the crisis), according to WIOD13, the overall employment connected to manufacturing in Slovakia has been almost 800 thousand jobs, while looking at the same type of data in the newest release, it has been less than 700 thousand. Approximately the same differences are visible among all countries in the sample. The number for manufacturing employment calculated from the newest release represented roughly 86% of the previous value. The smallest difference in the sample of countries in Table 4.6 was in Poland, -4%. When looking only at the direct employment in manufacturing, differences between the two versions are not major, but they are still present. For instance, in Slovakia in 2007, roughly 516 thousands (WIOD16) of people worked for manufacturing compared to approximately 527 thousands according to WIOD 2013 Release. Still, the numbers are not fully compatible. Countries presented in Table 4.6 and 4.7 were chosen arbitrarily trying to reflect all types of changes in manufacturing employment in absolute terms, i. e. a decline, an increase or almost no change during the observed period.

Table 4.6: Overall manufacturing employment (direct and indirect) according to WIOD 2013 Release and WIOD 2016 Release (2007, in thousands of persons employed)

	WIOD13	**WIOD16**	**% of WIOD13**
Germany	12 649,00	11 348,59	90%
Slovakia	783,72	674,75	86%
Poland	5 018,18	4 841,65	96%
China	284 411,84	260 444,88	92%
Great Britain	4 321,08	3 951,33	91%

Source: Author's calculations based on data from WIOD.org.

Thanks to the availability of the world input-output tables in previous years' prices for 1995 - 2009, we were able to provide a version of decomposition in constant prices, as well. Leaving out the effect of inflation between the individual years, we suppose that a decline in manufacturing employment should be a bit smaller in the case of constant prices. It is true for most of the countries in the sample, as we can see in Table 4.7. The average annual indices for individual countries differ in the two versions by -0.94 to 1.59 pp, with the average rate of change of 0.27 pp. Supposedly, it would be a larger difference, when looking at the production or value-added indicators.

Table 4.7: Generated manufacturing employment growth index, average annual indices for 1995 - 2009 in %, WIOD 2013 Release in current prices vs WIOD 2013 Release in constant prices

	WIOD13 current prices	**WIOD13 constant prices**
Germany	0,36%	0,41%
Slovakia	0,77%	1,96%
Poland	-0,02%	1,11%
China	1,52%	3,00%
Great Britain	-3,15%	-3,23%
USA	-2,37%	-2,37%

Source: Author's calculations based on data from WIOD.org.

In Table 4.8, we can see a manufacturing employment growth in Slovakia in a more detailed structure. Again, we provide a decomposition in current and constant prices. Since we have used a multiplicative form of a structural decomposition, the results are expressed as average annual indices and by multiplying all determinants of changes, we get a manufacturing employment growth index for a particular period. First, for all time periods, there has been an increase in manufacturing employment (calculated as an average of chain indices of people employed in manufacturing in subsequent time periods) which is visible in both versions. Again, considering the constant prices, an increase is larger, so an indication of deindustrialisation is less evident. In both versions, we can see that the changes in labour productivity contribute to the manufacturing employment growth most negatively, while changes in the final demand volume most positively. However, in current prices, the effect of a change in the final demand volume is 'overestimated' since it has not been inflated. Also, the effect of a change in labour productivity appears to be larger (more negative) in current prices. If we multiply these two effects, we can calculate a common growth of labour productivity and a final demand volume and get an unbiased effect of this change on a manufacturing employment growth.

Next, changes in the final demand structure and changes in the domestic final expenditures on manufacturing had the second largest effect on a manufacturing employment growth, regardless of a type of prices. This suggests that an increasing share of exports of a Slovak GDP and an increase in the use of domestic expenditures on manufacturing affect the employment in manufacturing quite significantly. The latter has a more negative contribution in the case of current prices, which is in compliance with a character of this type of a price.

Table 4.8: SDA of manufacturing employment growth in Slovakia, 1995 - 2009, average annual indices

	Man. empl. growth index	**Changes in labour productivity**	**Changes in the structure of production**	**Changes in the use of domestic intermediates (D_o)**	**Changes in the use of domestic intermediates (D_i)**	**Changes in the manufacturing final demand structure**	**Changes in the share of man. expenditures on total final demand**	**Changes in the final demand structure**	**Changes in the final demand volume**
					current prices				
1995-2002	**1,0074**	0,9604	1,0030	0,9842	0,9992	0,9956	1,0075	1,0096	1,0501
2003-2009	**1,0080**	0,8620	0,9991	0,9990	1,0008	0,9934	0,9880	1,0002	1,1925
1995-2009	**1,0077**	0,9099	1,0010	0,9916	1,0000	0,9945	0,9977	1,0049	1,1190
					constant prices				
1995-2002	**1,0144**	0,9420	1,0010	0,9773	1,0064	0,9915	1,0208	1,0192	1,0603
2003-2009	**1,0249**	0,9532	0,9907	0,9965	0,9995	0,9805	1,0090	1,0266	1,0729
1995-2009	**1,0196**	0,9476	0,9959	0,9868	1,0030	0,9860	1,0148	1,0229	1,0666

Source: Author's calculations based on data from WIOD.org.

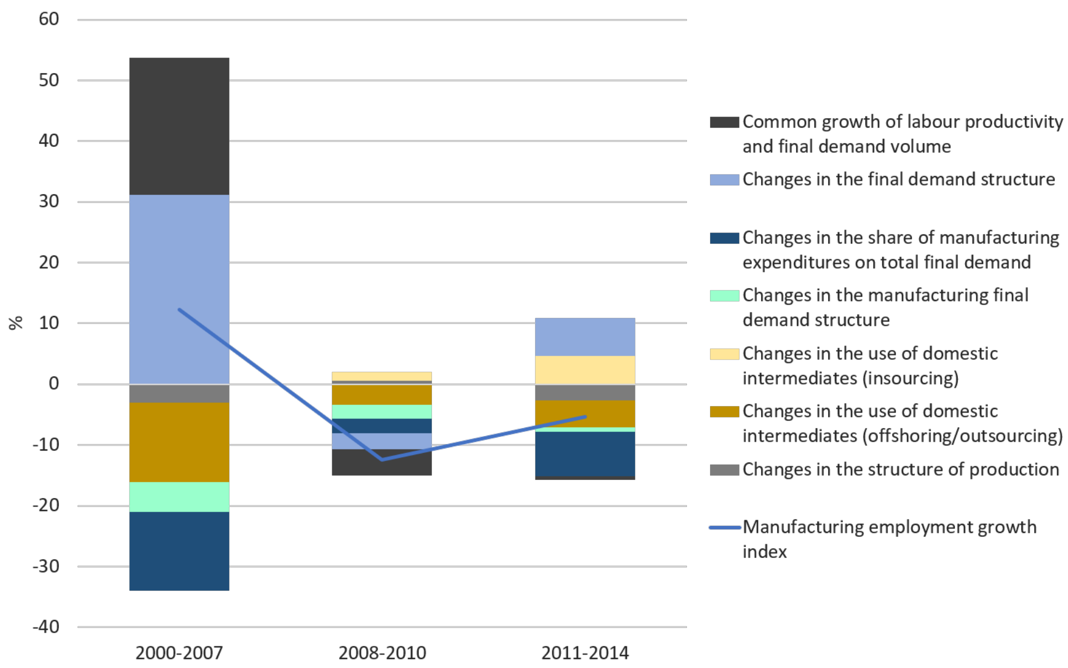
Besides, for example, in Great Britain, where we observe the value of a manufacturing employment growth index below one, a decrease in the domestic manufacturing expenditures seems to be even more prominent, again with a less negative impact in constant prices. If there are some minor discrepancies in the expectations on the effects in current and constant prices (e.g. a more negative contribution of the labour productivity improvements in constant prices in Slovakia for 1995-2002), they can be explained by the different development of prices between the two periods. This is however individual for each of the countries. The development of a price index in Slovakia can be seen in Appendix 17. After identifying the differences coming from different measures of changes (constant vs current prices), we redirect our attention to more up-to-date data and provide an SDA of changes in overall manufacturing employment for 2000 to 2014, in current prices. This subchapter has already offered some clue on which determinants play a crucial role in the process of deindustrialisation and could be considered as its drivers. We examine it in more detail in the following part of the thesis and provide a comparison for different time periods (pre-crisis, crisis and post-crisis), as well.

SDA of changes in the overall manufacturing employment for 2000 - 2014 in current prices

In Figure 4.28, we decompose the changes in manufacturing employment in Slovakia into the contribution of seven factors. For a deeper insight into the changing growth indices, we divided the observed time range into three periods: pre-crisis (2000 - 2007), crisis (2008 - 2010) and post-crisis period (2011 - 2014). In the first period, 12% growth of manufacturing employment has been observed. Slovakia experienced a significant increase in labour productivity at this time. This period was also characterised by an increasing share of exports on the Slovak GDP, together with the exports of manufacturing products, which meant a positive contribution to the employment growth in manufacturing. On the contrary, the share of inputs from domestic producers and other industries started to decline, which was likely caused by the increased imports of inputs.

Also, the share of domestic expenditures on manufacturing has been decreasing. Between 2008 and 2010, the number of persons employed in manufacturing decreased in all countries, except for Russia, India, Indonesia and Turkey. In Slovakia, there has been a 12% decrease in the manufacturing employment. In comparison with the first period, labour productivity experienced a slump. Changes in the final demand volume represented a negative contribution to the growth index, decline of expenditures on manufacturing included. Positive changes in the use of domestic intermediates (insourcing) were outweighed by the increased imports of inputs in some industries. Recently, the share of employment in manufacturing dropped to roughly 6%. This period is also characterised by the increase in the labour productivity, however not so major compared to the first period. It seems that the main factors causing the manufacturing employment decline are declining share of domestic expenditures on manufacturing and declining share of domestic inputs. This is consistent with the authors like Rodrik (2016) or Matsuyama (2009).

Figure 4.28: Structural decomposition of changes in manufacturing employment in Slovakia, cumulative changes in %

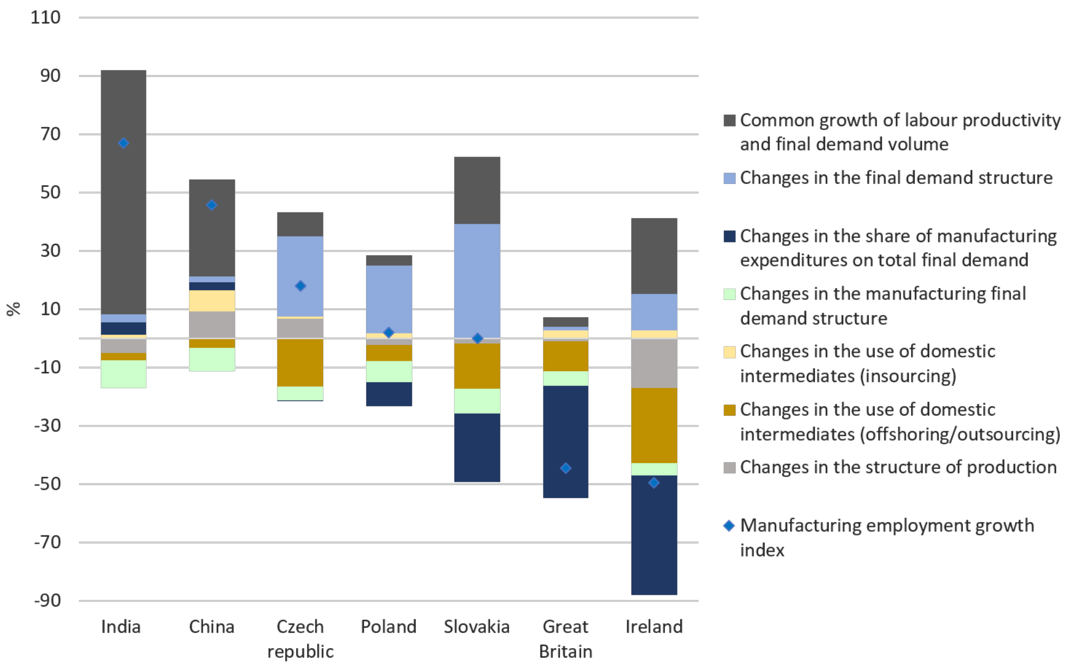


Source: Author's calculations based on data from WIOD.org

Comparing the results for different countries, we can identify two groups of countries, one smaller with an increase and one large with a decrease in employment (4.29). We can find some common patterns in each individual group. For instance, India and China are the economies with a positive manufacturing employment growth index

(67 and 45% respectively). Despite of the rapid labour productivity improvements, the volume of final demand increased significantly, which together caused a positive contribution to the manufacturing employment growth. In contrast to countries with a manufacturing employment decline, the increasing share of domestic expenditures on manufacturing contributed to the growth index positively and the change in the use of domestic intermediates (outsourcing/offshoring) was not so negative. Employment growth in the Czech republic was mainly supported by expanding exports.

Figure 4.29: Structural decomposition of changes in manufacturing employment in chosen countries between 2014 and 2000, cumulative changes in %



Source: Author's calculations based on data from WIOD.org

In the case of the Slovak republic, the decline between 2000 and 2014 was only minor, however, we can identify some common patterns with Great Britain and Ireland. In these countries, the employment in manufacturing dropped by almost 50%. This was mainly caused by a decreasing share of domestic expenditures on manufacturing and a decrease in the use of domestic inputs in the production process.

To conclude, based on all versions of decomposition analyses, the factors contributing to overall manufacturing employment changes are: negative effects of a labour productivity increase, a positive effect of increasing domestic expenditures for manufacturing, next, a positive effect of changes in the use of domestic intermediates and a positive contribution of changes in the final demand structure. Further, to verify the significance of these potential drivers of deindustrialisation identified by the SDA, we include them as covariates in a regression model of deindustrialisation proposed by Rodrik (2016).

4.6 Deindustrialisation model: Results

As mentioned before, our interest here is to verify the significance of potential drivers of deindustrialisation identified by a structural decomposition analysis. For this purpose, we use a baseline regression proposed by Rodrik (2016) that controls for the effect of demographic and income trends as well as country and time fixed effects. It is expressed as follows:

$$manshare_{it} = \beta_0 + \beta_1(lnpop_{it}) + \beta_2(lnpop_{it})^2 + \beta_3(lny_{it}) + \beta_4(lny_{it})^2 + \mathbf{X}\boldsymbol{\gamma} + \alpha_i + p_t + \epsilon_{it} \tag{4.2}$$

where $manshare_{it}$ represents the importance of manufacturing in country i and period t, pop_{it} is a population in country i and period t, y_{it} is GDP per capita in country i and period t , α_i are country fixed effects, and p_t are time dummies. As mentioned in the Methodology, we deviate from a Rodrik's basic model in two dimensions. First, the importance of manufacturing (manufacturing share) is measured as the overall employment in manufacturing generated by the final demand for manufacturing products. Second, potential determinants of the deindustrialisation identified by SDA are added as covariates in $\mathbf{X}\boldsymbol{\gamma}$. Moreover, in further steps, we also added a variable on the number of robots per population and employment to estimate the possible effects of automation on deindustrialisation.

We provide multiple versions of the results based on the data used. In the case of constant prices, the sample has a maximum of 560 observations, while for data in current prices, it is 644. The number of countries is limited to 40 and 43, respectively. The results of the versions in various prices are not so different, however, we can observe some dissimilarities. First, in Table 4.9, we can see that the estimated coefficient for the productivity of labour is negative, but statistically insignificant. Changes in the structure of production have a positive effect on the manufacturing employment as well as increase in the final demand volume. We also assumed that an increase in domestic manufacturing expenditures could have a positive effect on overall employment in manufacturing in given countries. Even though in the constant prices model the estimated coefficient is positive, it is not statistically significant. According to Peneder and Streicher (2018) and their analysis of manufacturing value added, it should be mostly true for highly developed and developed countries, i.e. if a developed country spends more domestic resources on manufacturing, it should contribute to higher generated value added in manufacturing. From our model, it seems that it is also true for employment in developed countries.[6] The estimated coefficient for an interaction term developed x man_del_ssbs is positive and quite significant. However, as we see further in Table 4.11, it is not true for a later period of 2000 - 2014. When looking at the model for the same time period (1995 - 2009) in current prices4.10, the final domestic expenditures on manufacturing are in general significant at 1% level and remain significant after adding all other covariates to the model (specification 8). From this perspective, also the effects of changes in the use of domestic intermediates seem to have a positive significant impact on manufacturing employment, as well as the changes in the structure of production.

In a regression model for the period of 2000 - 2014 (4.11), it seems that the share of domestic expenditures on manufacturing played quite a crucial role in countries with a positive manufacturing employment growth index, i.e. that higher domestic expenditures on manufacturing led to a manufacturing employment increase between the first and the last period and vice versa. Next, for a later period, the coefficient for

[6]In this case, the group of developed countries consists of highly developed and developed countries according to the United Nations classification in Appendix 3.

changes in the final demand structure is positive as predicted and also highly significant. As pointed out in the decomposition analysis, an increase in the share of exports on countries' GDP contributed to a larger extent to a manufacturing employment increase.

Table 4.9: Results of a deindustrialisation model, based on WIOD data in constant prices, 1995 - 2009

VARIABLES	(1) Total_gen	(2) Total_gen	(3) Total_gen	(4) Total_gen	(5) Total_gen	(6) Total_gen	(7) Total_gen	(8) Total_gen	(9) Total_gen	(10) Total_gen
lnpop	-0.124	-0.128	-0.119	-0.122	-0.126	-0.135	-0.125	-0.123	-0.142	-0.148
	(0.135)	(0.133)	(0.137)	(0.135)	(0.133)	(0.134)	(0.135)	(0.135)	(0.134)	(0.135)
lnpop_sqr	0.00575	0.00665	0.00535	0.00544	0.00591	0.00761	0.00601	0.00549	0.00886	0.00976
	(0.0136)	(0.0136)	(0.0136)	(0.0135)	(0.0135)	(0.0135)	(0.0135)	(0.0136)	(0.0137)	(0.0134)
lny	0.510**	0.505**	0.511**	0.506**	0.510**	0.464**	0.495**	0.505**	0.452**	0.427**
	(0.210)	(0.205)	(0.210)	(0.209)	(0.212)	(0.205)	(0.206)	(0.207)	(0.200)	(0.195)
lny_sqr	-0.0289**	-0.0288**	-0.0290**	-0.0287**	-0.0290**	-0.0265**	-0.0281**	-0.0287**	-0.0259**	-0.0245**
	(0.0113)	(0.0111)	(0.0113)	(0.0113)	(0.0114)	(0.0109)	(0.0112)	(0.0112)	(0.0106)	(0.0104)
man_del_ec	-0.000736									0.0157
	(0.00331)									(0.00986)
man_del_At		0.0620**							0.0749**	0.0833**
		(0.0275)							(0.0301)	(0.0317)
man_del_DoDi			0.0517							0.0651
			(0.0564)							(0.0590)
man_del_Bmsm				0.0239			0.144**	0.0225		0.0576**
				(0.0177)			(0.0620)	(0.0173)		(0.0260)
man_del_sy					-0.0182					0.00619
					(0.0361)					(0.0358)
man_del_y						0.0472*			0.0548*	0.0726**
						(0.0276)			(0.0275)	(0.0276)
developed x man_del_Bmsm							-0.130**			
							(0.0602)			
man_increase x man_del_Bmsm								0.0129		
								(0.0576)		
Constant	-1.637	-1.674	-1.706	-1.645	-1.614	-1.462	-1.608	-1.643	-1.480	-1.537
	(1.039)	(1.014)	(1.069)	(1.038)	(1.028)	(1.049)	(1.024)	(1.036)	(1.023)	(1.006)
Time FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Country FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	560	560	560	559	559	559	559	559	559	559
R-squared	0.491	0.495	0.493	0.494	0.491	0.496	0.500	0.494	0.501	0.512
Number of id	40	40	40	40	40	40	40	40	40	40

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 4.10: Results of a deindustrialisation model, based on WIOD data in current prices, 1995 - 2009

VARIABLES	(1) Total_gen	(2) Total_gen	(3) Total_gen	(4) Total_gen	(5) Total_gen	(6) Total_gen	(7) Total_gen	(8) Total_gen
lnpop	-0.125	-0.124	-0.132	-0.125	-0.121	-0.130	-0.135	-0.129
	(0.130)	(0.131)	(0.131)	(0.132)	(0.131)	(0.131)	(0.131)	(0.126)
lnpop_sqr	0.00566	0.00652	0.00645	0.00582	0.00612	0.00622	0.00693	0.00705
	(0.0133)	(0.0134)	(0.0132)	(0.0134)	(0.0133)	(0.0134)	(0.0132)	(0.0131)
lny	0.510**	0.499**	0.495**	0.510**	0.509**	0.495**	0.496**	0.488**
	(0.206)	(0.207)	(0.204)	(0.210)	(0.211)	(0.202)	(0.205)	(0.202)
lny_sqr	-0.0290**	-0.0284**	-0.0282**	-0.0290**	-0.0289**	-0.0281**	-0.0282**	-0.0279**
	(0.0111)	(0.0112)	(0.0110)	(0.0114)	(0.0114)	(0.0109)	(0.0110)	(0.0109)
man_del_At	0.00440*							0.00389
	(0.00230)							(0.00253)
man_del_DoDi		0.00613**						0.00562**
		(0.00232)						(0.00218)
man_del_Bmsm			0.00887***			0.0174	0.0132***	0.00776**
			(0.00315)			(0.0121)	(0.00314)	(0.00311)
man_del_sy				-0.00135				-0.000455
				(0.00273)				(0.00289)
man_del_ecy					-0.00473**			-0.00341*
					(0.00191)			(0.00184)
developed x man_del_Bmsm						-0.0103		
						(0.0126)		
man_increase x man_del_Bmsm							-0.0106	
							(0.00768)	
Constant	-1.638	-1.600	-1.569	-1.634	-1.638	-1.571	-1.564	-1.544
	(1.022)	(1.029)	(1.006)	(1.039)	(1.047)	(0.995)	(1.016)	(0.996)
Time FE	YES	YES	YES	YES	YES	YES	YES	YES
Country FE	YES	YES	YES	YES	YES	YES	YES	YES
Observations	560	560	560	560	560	560	560	560
R-squared	0.494	0.496	0.498	0.491	0.496	0.500	0.501	0.508
Number of id	40	40	40	40	40	40	40	40

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 4.11: Results of a deindustrialisation model, based on WIOD data in current prices, 2000 - 2014

VARIABLES	(1) Total_gen	(2) Total_gen	(3) Total_gen	(4) Total_gen	(5) Total_gen	(6) Total_gen	(7) Total_gen	(8) Total_gen	(9) Total_gen
lnpop	-0.0985	-0.0983	-0.100	-0.0847	-0.0987	-0.102	-0.0990	-0.0844	-0.0819
	(0.0844)	(0.0883)	(0.0892)	(0.0827)	(0.0822)	(0.0888)	(0.0868)	(0.0809)	(0.0801)
lnpop_sqr	0.0105	0.0105	0.0107	0.00939	0.00928	0.0101	0.00770	0.00827	0.00823
	(0.0122)	(0.0126)	(0.0126)	(0.0122)	(0.0122)	(0.0125)	(0.0124)	(0.0122)	(0.0121)
lny	0.174	0.187	0.191	0.169	0.176	0.178	0.185	0.174	0.177
	(0.223)	(0.234)	(0.234)	(0.222)	(0.219)	(0.228)	(0.225)	(0.217)	(0.218)
lny_sqr	-0.00919	-0.00975	-0.01000	-0.00879	-0.00924	-0.00935	-0.00976	-0.00904	-0.00921
	(0.0115)	(0.0120)	(0.0120)	(0.0114)	(0.0113)	(0.0117)	(0.0116)	(0.0112)	(0.0113)
man_del_At	0.0687								0.0372
	(0.0474)								(0.0420)
man_del_DoDi		-0.00430							0.0242
		(0.00586)							(0.0441)
man_del_Bmsm			-0.0117			-0.00110	-0.0127		0.00452
			(0.00756)			(0.00982)	(0.00759)		(0.0256)
man_del_sy				0.0629***				0.0563***	0.0599***
				(0.0154)				(0.0141)	(0.0162)
man_del_ecy					-0.0299*			-0.0259	-0.0219
					(0.0175)			(0.0175)	(0.0169)
developed x man_del_Bmsm						-0.0108			
						(0.00747)			
man_increase x man_del_Bmsm							0.0265***		
							(0.00651)		
Constant	-0.515	-0.479	-0.492	-0.529	-0.417	-0.415	-0.429	-0.508	-0.597
	(1.129)	(1.165)	(1.161)	(1.101)	(1.058)	(1.126)	(1.114)	(1.060)	(1.084)
Time FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Country FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	599	644	644	599	599	644	644	599	599
R-squared	0.546	0.550	0.551	0.554	0.552	0.553	0.569	0.560	0.562
Number of id	43	43	43	43	43	43	43	43	43

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

After merging the two datasets in current prices, we get the model prediction for a period of 1995 - 2014, while the data for 1995 to 1999 were taken from the WIOD 2013 Release and the rest of the data from WIOD 2016 Release. It holds that data from different releases are not comparable, however, this way, we were able to estimate the effects of changes for a longer period, which is also an advantage. With a dummy for the most recent period (2000 - 2014) we get the results presented in Appendix 18. The coefficient for changes in the final demand structure remains positive and highly statistically significant, so the increasing exports can significantly contribute to the employment in manufacturing. Again, it has been confirmed that the share of domestic expenditures on manufacturing played quite a crucial role in countries with a positive manufacturing employment growth index.

Furthermore, we want to estimate the possible effects of *automation* on the employment in manufacturing. Since the concept of automation is very new and the number of robots used in manufacturing started to increase dramatically only in recent years, we must approach the results with caution. Data about the stock of robots in individual countries come from the International Federation of Robotics (IFR) Database (IFR, 2017). In a regression model we used i.) the number of robots per population (per million of inhabitants) and ii.) the number of robots per employment (per million of employed people). The results are presented in Table 4.12 and 4.13. The effects of the use of industrial robots on the manufacturing employment seem to be quite significant, however, the size of the effect is extremely small. What is intriguing is the fact that the estimated impact of robots on employment in manufacturing is positive. This implies that the use of robots in manufacturing may even increase, directly or indirectly, the employment in this industry. However, as mentioned before, the estimated effect is extremely small, so it should be treated with great caution. Adding also the covariates from the structural decomposition analysis, only the changes in the final demand structure (increasing of the exports) and changes in the share of domestic expenditures on manufacturing in developed economies remained significant together with the robots.

Table 4.12: Results of a deindustrialisation model, based on WIOD data in current prices, 2000 - 2014

VARIABLES	(1) Total_gen	(2) Total_gen	(3) Total_gen
lnpop	-0.296	-0.277	-0.292
	(0.200)	(0.192)	(0.194)
lnpop_sqr	0.0288	0.0273	0.0263
	(0.0267)	(0.0258)	(0.0262)
lny	0.343	0.335	0.336
	(0.311)	(0.294)	(0.299)
lny_sqr	-0.0189	-0.0184	-0.0186
	(0.0161)	(0.0153)	(0.0155)
robots_pe	2.87e-05**	2.83e-05***	2.65e-05**
	(1.07e-05)	(1.02e-05)	(9.91e-06)
man_del_sy		0.0825***	
		(0.0167)	
man_del_Bmsm			-0.0251*
			(0.0138)
man_increase x man_del_Bmsm			0.0215***
			(0.00642)
Constant	-0.720	-0.815	-0.658
	(1.652)	(1.558)	(1.589)
Time FE	YES	YES	YES
Country FE	YES	YES	YES
Observations	555	518	554
R-squared	0.592	0.602	0.603
Number of id	37	37	37

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 4.13: Results of a deindustrialisation model, based on WIOD data in current prices, 2000 - 2014

VARIABLES	(1) Total_gen	(2) Total_gen	(3) Total_gen
lnpop	-0.296	-0.278	-0.292
	(0.200)	(0.192)	(0.194)
lnpop_sqr	0.0289	0.0275	0.0263
	(0.0267)	(0.0258)	(0.0261)
lny	0.343	0.332	0.336
	(0.310)	(0.293)	(0.298)
lny_sqr	-0.0189	-0.0183	-0.0186
	(0.0161)	(0.0152)	(0.0155)
robots_pp	1.50e-05***	1.47e-05***	1.39e-05***
	(5.15e-06)	(4.85e-06)	(4.78e-06)
man_del_sy		0.0823***	
		(0.0167)	
man_del_Bmsm			-0.0258*
			(0.0138)
man_increase x man_del_Bmsm			0.0216***
			(0.00643)
Constant	-0.724	-0.808	-0.665
	(1.650)	(1.558)	(1.587)
Time FE	YES	YES	YES
Country FE	YES	YES	YES
Observations	555	518	554
R-squared	0.592	0.601	0.604
Number of id	37	37	37

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The same is true using the number of robots per million of people employed in a country 4.13. The effects are even more significant but still very small.

Policy implications

Since the character of manufacturing has been changing dramatically in recent years, appropriate policy responses are crucial for a country to succeed in generating growth and new jobs. As mentioned by many authors, e.g. Haraguchi et al. (2017) or Rodrik (2016), manufacturing still matters and policymakers have power to direct the steps towards effective restructuring and reforms. A dialogue between government and the productive sector (private or public enterprises) is a key.

In the European context, there are major efforts to revive an industrial policy. The manufacturing becomes one of the top priorities again and it is also reflected by the call for a new industrial policy and an ambition to set up a new post of a Commission Vice-president for Industry. That all should be a hot topic after the May 2019 EU elections (Euractiv.sk, 2019). New industrial policy has mostly being enforced by Germany and France but the private European sector including Slovakia has mobilised as well. The new policy should not be based on protectionism but rather on a strengthening of competitiveness towards China and South Korea, i.e. countries with a strong manufacturing concentration. Our results suggest that there is a large market for manufacturing products outside the major developed economies, e.g. in the aforementioned South Asian economies. We showed that participation of G7 in manufacturing subsystems of China, risers and the rest of the world (forward linkages) is relatively low and major developed economies do not fully integrate in new markets for manufacturing products outside their 'territories'. Based on our research, this represents one of the major challenges of new industrial policies.

When it comes to new areas of interest, on February 19, 2019, A Franco-German Manifesto for a European industrial policy fit for the 21st Century has been published. It says that the most important priorities are to finance and support new technologies including artificial intelligence, carbon neutral economy, the change in a competition and state-aid policy and the protection against non-European competitors. Repeatedly, the ambitious industrial strategies are needed, so the EU would be able to compete with other global regions like China, India or the United States, who already set industry as a top priority of their political agendas. They should try to grasp a larger part in terms of employment and value added when considering the final demand for manufacturing products in these countries. It is also necessary to prepare action plans for the key areas of new industrial policy (enhancing the world productivity, fight against climate changes and strengthening the technological development) with a proper investment plan and a support from different European policies.

Moreover, the question of what types of policies should be supported in countries being in different stage of their development arises. Some years ago, authors used the terms horizontal (supporting all sectors) and vertical industrial policy (supporting specific industries). Then, a new, less extreme approach has been preferred in the context of both the US and the EU. Aiginger and Sieber (2006) have labelled this European Commission approach towards industrial policy as the so-called matrix approach characterised by a strong horizontal component with policy measures tailored to specific industries. Such policies are directed towards *public private partnerships* and *research-industry co-operations*. Furthermore, Rodrik and Subramanian (2005) distinguish policies that target the business development - *pro-business* - from policies that target the development of free market - *pro-market* policies. According to the authors, the degree of industry maturity determines which of these policies to invoke. In developing countries with a weak institutional setting it should be a pro-business orientated policy, including infant-industry protection, and vice versa. Likewise Acemoglu (2006) suggests that in earlier stages of development, industrial policy should be focused more on supporting industrial development and in the later stages, it should stimulate competition.

Using principal component analysis, Farla (2015) analysed what kind of approach (pro-business or pro-market) is successful in stimulating economic growth in different countries. The results suggest that pro-business policy indicator is positively associated with economic growth in middle-income countries but not in high income countries. There is no clear evidence that pro-market policies are positively associated with economic performance. They are usually applied in the next phase of industrial development to increase market competition and boost innovation and rise of technology. However, we cannot forget on the importance of fostering new manufacturing industries, especially in countries still mired in poverty, such as those in Sub-Saharan Africa or south Asia, as we showed in the empirical part of the thesis when identifying the beginning of deindustrialisation in different country groups.

Also, Landesmann and Stöllinger (2018) discuss the importance of - what they call - 'appropriate industrial policy' (AIP) for countries at different development stages. According to them, in the age of increasing integration, it became hardly possible to use tariff protection or other traditional instruments of industrial policy such as industry-specific subsidies. In Europe, they observe a strong move of industrial capacities towards a 'Central Manufacturing Core' and a revival of thinking about industrial policy. They also warn that the focus on innovation and R&D is biased in favour of the more advanced economies, while the needs of less advanced regions have been neglected. In short, based on multiple characteristics, these countries should focus on the absorption of technology capacities, generalised literacy in finance, vocational training and on support focused on sectors with high technology and skill development potential. More precise characteristics are presented in their matrix of country characteristics and 'AIP'.

In the context of the US economy, policy recommendations are all intended to make the United States a more attractive location for manufacturing production. They do not support special subsidies but they want to enhance skills of the workforce, which are reported to be comparatively weak. They lag behind many other countries in the effective vocational education and job training programs. Moreover, the educational attainment of young people is falling behind that in Canada, Japan or Korea. Germany is a country that managed to use a *high quality vocational education system* to improve the skills of their workforce. Skills are in fact most frequently pronounced in all new industrial strategies. Second, it is *government support of new technologies* (Baily and Bosworth, 2014). It is even more important in the context of emerging reshoring and service activities.

This field has been precisely examined by Prettner et al. (2018). Their model suggest that re-negotiating trade deals would not be an effective tool if the goal is to raise wages and employment in manufacturing at home. The most promising alternative would be to ensure that people acquire *skills* which are *complementary to more sophisticated industrial work* provided by automation technologies. Therefore, additional funds should be provided for education, in particular for re-training that would benefit workers who lose their jobs due to increase in automation. However, taking into account recent development of education and trade policies in most of the countries, this is not likely to occur soon. As seen in the direct statistics, the share of people working in services has been increasing, however, also these jobs are still strongly connected to manufacturing. Nowadays, a lot of new types of service activities, for example in marketing, have emerged. The number of people employed in this industry has been probably unimaginable some decades ago. So, we can predict that a lot of new industries, which cannot be precisely defined now, will emerge in the future and the economies should be prepared to such changes. Also, our research carefully suggest that the automation could have directly and indirectly a slightly positive effect on employment, so the government support towards education complementary to automation is inevitable.

Last, but not least, all theses changes towards new industrial policies should be accompanied by great *environmental responsibility* (UNIDO, 2017). Governments in many countries prefer subsidising renewable energy alternatives rather than pursuing the direct policy of higher taxes on fossil fuel-based sources. However, it is important for industrial policies to have not only environmental but also an economic efficiency component. State governments should also take greater initiatives in the funding of basic research to develop the technology that would allow significant reductions in the environmental intensity of manufacturing production. Even though, some progress has been achieved in this area, still more needs to be done. It is inevitable for low-income countries to contribute to improved environmental intensity in production, which is something that requires a form of international collaboration.

Conclusion

In recent years, deindustrialisation trends have been documented in many economies and what is even more intriguing, not only among advanced post-industrial countries. Our aim was to examine whether the importance of manufacturing for generating growth and jobs has really been decreasing. We analysed not only the beginning and the extent of the process, but also the causes and drivers of this phenomenon. Direct deindustrialisation is the one we can observe from direct statistics in the form of a decreasing share of value added in manufacturing on the total value added in current prices as well as a decreasing share of people employed in manufacturing on the total employment.

Most of the advanced economies reached their peak of industrialisation in the 1950s or 1960s. The picture is somewhat different when looking at the group of developing countries. It is very difficult to determine the exact beginning of the deindustrialisation process for the whole group. Most of the countries reached the peak in the 1980s or early 1990s, however, at much lower levels of income compared to early industrialisers. Looking at lower-productivity Asian countries, we observe a different trend. Many of them (most notably China and India, but also Indonesia, Korea or Taiwan) were able to avoid the process of deindustrialisation and in addition, they were even able to bring in new manufacturing jobs. Globally, due to a strong concentration of manufacturing in specific countries, we can observe quite a stable trend in the share of employment and output since 1970.

Since manufacturing is not only production and indirectly, it is able to connect activities coming from various industries, we cannot neglect these linkages. Thus, using the subsystem analysis, we show that the importance of manufacturing for the world economy has not declined during the last decades. We argue that the observed deindustrialisation measured by the direct employment and value-added shares of manufacturing underestimates the importance of manufacturing. We discoverer a much higher importance of manufacturing for domestic economies once we account for an outsourcing of economic activities outside the direct manufacturing production. At the same time, we argue that the peak of outsourcing levels in G7 countries was reached almost two decades ago. This coincides with the emergence of offshoring as an important factor that contributes to more fundamental trends in deindustrialisation in many countries. Outsourcing exaggerated only the observed deindustrialisation in G7 countries. The real importance of manufacturing has not been affected by it because the activities were performed by service and other industries in the same countries. It was the offshoring that led to a shift of production and employment from G7 countries to China and other Risers. At the same time, G7 countries benefited only marginally from a high increase of final demand for manufacturing products in China and the Risers.

The employment generated by the final demand for manufacturing has not declined globally over the last two decades. But it is much more concentrated in a few industrialised countries. We document a decline in the importance of manufacturing in G7 countries driven by offshoring. But we point out another source of relatively poor performance of manufacturing in G7 countries, i.e. the idle participation in the completion of final products consumed in the rest of the world, especially in China and other Risers. The final demand for manufacturing products in those countries increased immensely but G7 grasped only a tiny share in terms of generated value added and employment. Not even the integration of manufacturing in the service subsystem could compensate for the decline of relative importance of manufacturing in these countries.

Using the structural decomposition analysis, we also identified some of the less pronounced drivers of this process. Based on all versions of decomposition analyses, the factors contributing to overall manufacturing employment changes mostly include: negative effects of the labour productivity increase, a positive effect of increasing domestic expenditures for manufacturing, a positive effect of changes in the use of domestic intermediates and a positive contribution of changes in the final demand structure. To verify their significance, we included them as covariates in a regression model of deindustrialisation proposed by Rodrik. It was confirmed that the increasing share of domestic expenditures on manufacturing can contribute positively to the employment in manufacturing and it is mostly true for developed countries and those economies which experienced an increase in the manufacturing employment growth index in the last decades. Next, the positive effects of the increasing share of domestic intermediates and the share of exports on a country's GDP affecting the overall (direct and indirect) manufacturing employment were estimated. The estimated coefficient on automation was highly significant, however, the size of the effect is extremely small, and it is positive.

Lastly, even though we witness a decline in manufacturing in terms of output and employment, we showed that the importance of manufacturing for the world economy has not declined. There are still many activities that depend directly or indirectly on manufacturing in a domestic economy and its importance for economic development is still strong. This has been also reflected in the calls for new industrial policies in advanced countries. It should be directed towards public private partnerships and research-industry co-operations, as well as a high-quality vocational education system. Last but not least, all these changes towards new industrial policies should be accompanied by great environmental responsibility.

Moreover, after studying the topic, new research questions can be generated. In future research, it would be preferable to have all data in constant prices, so the results would be adjusted for the changes in relative prices. Second, for broader country coverage and several robustness checks, we should also use the data from other databases, such as the OECD TiVA (Trade in Value-Added) or the EORA multi-regional input-output database. Also, it would be beneficial to look at the forward linkages in more detail, since key industries are characterised as having high forward and backward linkages. Thus, it would be interesting to find out whether manufacturing is still one of the key industries and what individual industries play a crucial role in terms of innovation and technology spillover effects.

In addition, we analysed the effects of the changing face of manufacturing mainly in major developed economies. However, it would be essential to shift our focus to the topic of premature deindustrialisation in poor African, Latin American or Asian countries, as well. Since the majority of activities is still linked to manufacturing, as also shown by our research, premature deindustrialisation could pose a real threat for developing economies, and not only in terms of economic growth. All activities depending on manufacturing and all high value-added business services need to be interlinked with a strong manufacturing industry. For instance, in Africa or Latin America, people are concentrated in trivial low-productivity services instead of high-productivity activities such as manufacturing. Thus, this seems to be even more alarming than deindustrialisation in major developed economies. The data from aforementioned databases would allow us to examine the phenomenon of premature deindustrialisation in more depth.

The effects of automation on the employment are open to further analysis, since it is becoming a crucial topic for the near future. Also, according to our results, it seems that its effect on employment is quite ambiguous and on top of that, there is an indication that it could be even positive.

Bibliography

Acemoglu, D. e. a. (2006). Distance to frontier, selection, and economic growth. *Journal of the European Economic Association*, 4:37–74.

Aiginger, K. and Sieber, S. (2006). The matrix approach to industrial policy. *International Review of Applied Economics*, 20(5).

Amirapu, A. and Subramanian, A. (2015). Manufacturing or services? An Indian illustration of a development dilemma. *CGD Working Paper 409*.

Baily, M. and Bosworth, B. (2014). US manufacturing: Understanding its past and its potential future. *The Journal of Economic Perspectives*, 28(1):3–26.

Baldwin, R. (2016). *The Great Convergence: Information Technology and the New Globalization*. Belknap Press: An Imprint of Harvard University.

Baldwin, R. (2017). Factory-free Europe? A two unbundlings perspective on Europe's 20th century manufacturing miracle and 21st century. In Fontagné, L. and A, H., editors, *The Factory-Free Economy: Outsourcing, Servitization, and the Future of Industry*, chapter 1. Oxford University Press, Oxford.

Berger, T. and Frey, C. (2016). Structural transformation in the oecd: Digitalisation, deindustrialisation and the future of work. *OECD Social, Employment and Migration Working Papers No 193*.

Bernard, A. B. and Fort, T. C. (2017). Factoryless goods producers in the US. In Fontagné, L. and A, H., editors, *The Factory-Free Economy: Outsourcing, Servitization, and the Future of Industry*, chapter 5. Oxford University Press, Oxford.

Bernard, A. B., Smeets, V., and Warzynski, F. (2017). Rethinking deindustrialization. *Economic Policy*, 32(89):5–38.

Biénkowska, E. (2015). Reindustrialisation of Europe: Industry 4.0 - innovation, growth and jobs Forum Europe conference. European Commission.

Castillo, M. and Neto, A. M. (2016). Premature deindustrialization in Latin America. *ECLAC - Production Development Series No. 205*, (205).

Ciriaci, D. and Palma, D. (2016). Structural change and blurred sectoral boundaries: assesing the extent to which konwledge-intensive business services satisfy manufacturing final demand in western countries. *Economic Systems Research*, 28(1):55–77.

Clark, C. (1940). *The Conditions of Economic Progress First Edition*. London: McMillan & Co Ltd.

Croner, D., Koller, W., and Mahlberg, B. (2018). Economic drivers of greenhouse gas-emissions in small open economies: A hierarchical structural decomposition analysis. *MPRA Paper No. 85755*.

Dasgupta, S. and Singh, A. (2006). *Manufacturing, services and premature deindustrialization in developing countries: A Kaldorian analysis*. Number 2006/49. Research Paper, UNU-WIDER, United Nations University (UNU).

De Boer, P. (2009). Multiplicative decomposition and index number theory: An empirical application of the Sato-Vartia decomposition. *Economic Systems Research*, 21(2):163–174.

Deming, D. (2017). Will manufacturing jobs come back? Available online at http://http://econofact.org/will-manufacturing-jobs-come-back, last accessed 09/10/2017.

Dietzenbacher, E. and Los, B. (1998). Structural decomposition techniques: Sense and sensitivity. *Economic Systems Research*, 10(4):307–324.

Dietzenbacher, E. and Temursho, U. (2012). Input-output impact analysis in current or constant prices: Does it matter? *Journal of Economic Structures*, 1(04).

Ebenstein, A., Arrison, A., and McMillan, M. (2017). Why are American workers getting poorer? China, trade and offshoring. In Fontagné, L. and A, H., editors, *The Factory-Free Economy: Outsourcing, Servitization, and the Future of Industry*, chapter 8. Oxford University Press, Oxford.

Euractiv.sk (2019). Slovenské firmy žiadajú post eurokomisára pre priemysel. Available online at https://https://euractiv.sk/section/energetika/news/slovenske-firmy-ziadaju-eurokomisara-pre-priemysel/, last accessed 2019/03/23.

European Commission (2010). Europe 2020: A strategy for smart, sustainable and inclusive growth. Brussels.

European Commission (2012). A stronger European industry for growth and economic recovery. Industrial Policy Communication Update, Brussels.

European Commission (2014). For a European industrial renaissance. Brussels.

Farla, K. (2015). Industrial policy for growth. *Journal of Industry, Competition and Trade*, 15:257–282.

Felipe, J. and Mehta, A. (2016). Deindustrialisation? A global perspective. *Economics Letters*, (149):148–151.

Felipe, J., Mehta, A., and Rhee, C. (2018). Manufacturing matters... but it's the jobs that count. *Cambridge Journal of Economics*, 43:139–168.

Fontagné, L. and Harrison, A. (2017). Introduction: Outsourcing, servitization, and the future of industry. In Fontagné, L. and A, H., editors, *The Factory-Free Economy: Outsourcing, Servitization, and the Future of Industry*, pages 1–23. Oxford University Press, Oxford.

Graetz, G. and Michaels, G. (2015). Robots at work. *CEP Discussion Paper No 1335*.

Haraguchi, N., Cheng, C. F. C., and Smeets, E. (2017). The importance of manufacturing in economic development: Has this changed? *World Development*, 93:293–315.

IFR (2017). World robotics 2017 edition: Source and methods WR industrial robots 2017. *IFR Publishing, Frankfurt.*

Imbs, J. (2017). Structural change in the OECD: Some facts. In Fontagné, L. and A, H., editors, *The Factory-Free Economy: Outsourcing, Servitization, and the Future of Industry*, chapter 3. Oxford University Press, Oxford.

Jacobides, M. G. and Winter, S. G. (2005). The co-evolution of capabilities and transaction costs: Explaining the institutional structure of production. *Strategic Management Journal*, 26(5):395–413.

Kaldor, N. (1966). *Causes of the slow rate of growth of the United Kingdom.* Cambridge University Press, Cambridge UK.

Kaldor, N. (1967). *Strategic Factors in Economic Development.* Ithaca, New York State School of Industrial and Labor Relations, Cornell University.

Kramarz, F. (2017). Offshoring, wages, and employment: Evidence from data matching imports, firms and workers. In Fontagné, L. and A, H., editors, *The Factory-Free Economy: Outsourcing, Servitization, and the Future of Industry*, chapter 9. Oxford University Press, Oxford.

Kuznets, S. (1966). *Modern Economic Growth: Rate, Structure and Spread.* New Haven: Yale University Press.

Landesmann, M. and Stöllinger, R. (2018). *Structural change, trade and global production networks: An 'appropriate industrial policy' for peripheral and catching-up economies.* https://doi.org/10.1016/j.strueco.2018.04.001.

Luptáčik, M. (2010). *Mathematical Optimization and Economic Analysis.* Springer. ISBN 978-0-387-89551-2.

Matsuyama, K. (2009). Structural change in an interdependent world: A global view of manufacturing decline. *Journal of the European Economic Association*, 7(2-3):478–486.

Miller, R. E. and Blair, P. D. (2009). *Input-output analysis: Foundations and extensions.* Cambridge University Press.

Montresor, S. and Vittucci Marzetti, G. (2010). The deindustrialisation/tertiarisation hypothesis reconsidered: A subsystem application to the OECD7. *Cambridge Journal of Economics*, 35(2):401–421.

Mucha-Leszko, B. et al. (2016). Causes and consequences of deindustrialization in the euro area. *Problems of World Agriculture/Problemy Rolnictwa Åšwiatowego*, 16(31).

Peneder, M. R. and Streicher, G. (2017). De- vs. re-industrialisation: Is structural change reversible? *WIFO Working Paper No. 506/2016*, (revised, April 11 2017).

Peneder, M. R. and Streicher, G. (2018). De-industrialization and comparative advantage in the global value chain. *Economic Systems Research*, 30.

Prettner, K., Strulik, H., and Krenz, A. (2018). Robots, reshoring, and the lot of low-skilled workers. *Cege Discussion Papers, July 2018.*

Rodrik, D. (2013). Unconditional convergence in manufacturing. *Quarterly Journal of Economics*, 128(1):165–204.

Rodrik, D. (2016). Premature deindustrialization. *Journal of Economic Growth*, 21(1):1–33.

Rodrik, D. (2017). Worries about premature industrialisation. *The Economist.* Available online at https://www.economist.com/news/special-report/21729864-automation-less-threat-workers-emerging-world-it-made-out, last accessed 2017/06/10.

Rodrik, D. and Subramanian, S. (2005). From "Hindu growth" to productivity surge: The mystery of the indian growth transition. *IMF Staff Papers*, 52(2).

Romano, L. and Trau, F. (2017). The nature of industrial development and the speed of structural change. *Structural Change and Economic Dynamics*, 42(2017):26–37.

Rose, A. and Casler, S. (1996). Input-output structural decomposition analysis: A critical appraisal. *Economic Systems Research*, 8(1):33–62.

Rostow, W. W. (1960). *The Stages of Economic Growth.* Cambridge: Cambridge University Press.

Rowthorn, R. and Ramaswamy, R. (1997). Deindustrialisation: Causes and implications. *Economic Issues.* International Monetary Fond.

Rowthorn, R. and Ramaswamy, R. (1999). Growth, trade, and deindustrialization. *IMF Staff Papers*, 46.

Rowthorn, R. and Wells, J. R. (1987). *De-industrialization and Foreign Trade.* Cambridge: Cambridge University Press.

Szirmai, A. (2012). Industrialisation as an engine of growth in developing countries, 1950–2005. *Structural Change and Economic Dynamics*, 23(4):406–420.

Szirmai, A. and Verspagen, B. (2015). Manufacturing and economic growth in developing countries, 1950-2005. *Structural Change and Economic Dynamics*, 34:46–59.

The Economist (2017). Politicians cannot bring back old-fashioned factory jobs. january 14th, 2017. Available online at https://www.economist.com/news/briefing/21714330-they-dont-make-em-any-more-politicians-cannot-bring-back-old- fashioned-factory-jobs, last accessed 2017/01/16.

Timmer, M. (2012). The world input-output database (WIOD): Contents, sources and methods.

Timmer, M. P., Bart, L., Robert, S., de Vries K, and Gaaitzen, J. (2016). An anatomy of the global trade slowdown based on the WIOD 2016 release. *GGDC Research Memoranda*, (162).

Timmer, M. P., de Vries, G., and de Vries, K. (2015). *Patterns of structural Change in Developing Countries*, pages 65–83. Routledge Handbooks. Routledge.

Timmer, M. P. and Feenstra, Robert C., a. I. R. (2015). The next generation of the Penn World Table. *American Economic Review*, 105(10). 3150-3182.

Tregenna, F. (2014). A new theoretical analysis of deindustrialisation. *Cambridge Journal of Economics*, 38(6):1373–1390.

UNIDO (2017). Structural change for inclusive and sustainable industrial development. Vienna.

White, H. (1996). Adjustment in Africa. *Development and Change*, 27:785–815.

List of Appendices

Appendices

.0.1 Country coverage in the World Input-Output Database

AUS	Australia
AUT	Austria
BEL	Belgium
BGR	Bulgaria
BRA	Brazil
CAN	Canada
CHE	Switzerland
CHN	China
CYP	Cyprus
CZE	Czech Republic
DEU	Germany
DNK	Dennmark
ESP	Spain
EST	Estonia
FIN	Finland
FRA	France
GBR	United Kingdom
GRC	Greece
HRV	Croatia
HUN	Hungary
IDN	Indonesia
IND	India
IRL	Ireland
ITA	Italy
JPN	Japan
KOR	Korea

LTU	Lithuania
LUX	Luxembourg
LVA	Latvia
MEX	Mexico
MLT	Malta
NLD	Netherlands
NOR	Norway
POL	Poland
PRT	Portugal
ROU	Romania
RUS	Russia
SVK	Slovak Republic
SVN	Slovenia
SWE	Sweden
TUR	Turkey
TWN	Taiwan
USA	United States
ROW	Rest of the World

Source: Author based on World Input-Output Database, 2016

.0.2 Country and the employment variable coverage in the GGDC 10-sector database plus sectors covered in the database

Acronym	**Country**	**Employment by sector**
Sub-Saharan Africa		
BWA	Botswana	1964-2010
ETH	Ethiopia	1961-2010
GHA	Ghana	1960-2010
KEN	Kenya	1969-2010
MWI	Malawi	1966-2010
MUS	Mauritius	1970-2010
NGA	Nigeria	1960-2011
SEN	Senegal	1970-2010
ZAF	South Africa	1960-2010
TZA	Tanzania	1960-2010
ZMB	Zambia	1965-2010
North Africa		
EGY	Egypt	1960-2012
MOR	Morocco	1960-2012
Asia		
CHN	China	1952-2011
HKG	Hong Kong	1974-2011
IND	India	1960-2010
IDN	Indonesia	1961-2012
JPN	Japan	1953-2012
KOR	South Korea	1963-2011
MYS	Malaysia	1975-2011
PHL	Philippines	1971-2012

SGP	Singapore	1970-2011
TWN	Taiwan	1963-2012
THA	Thailand	1960-2011
Latin America		
ARG	Argentina	1950-2011
BOL	Bolivia	1950-2010
BRA	Brazil	1950-2011
CHL	Chile	1950-2012
COL	Colombia	1950-2010
CRI	Costa Rica	1950-2011
MEX	Mexico	1950-2012
PER	Peru	1960-2011
VEN	Venezuela	1950-2011
North America		
USA	The US	1950-2010
Europe		
DEW	West Germany	1950-1991
DNK	Denmark	1948-2011
ESP	Spain	1950-2011
FRA	France	1950-2011
GBR	United Kingdom	1948-2011
ITA	Italy	1951-2011
NLD	The Netherlands	1950-2011
SWE	Sweden	1950-2011

Source: Author based on GGDC 10-sector database by Timmer et al. (2015).

SIC Rev. 3.1	ASD sector name	ISIC Rev. 3.1 description
AtB	Agriculture	Agriculture, Hunting and Forestry, Fishing
C	Mining	Mining and Quarrying
D	Manufacturing	Manufacturing
E	Utilities	Electricity, Gas and Water supply
F	Construction	Construction
G+H	Trade services	Wholesale and Retail trade; repair of motor vehicles, motorcycles and personal and household goods, Hotels and Restaurants
I	Transport services	Transport, Storage and Communications
J+K	Business services	Financial Intermediation, Renting and Business Activities (excluding owner occupied rents)
L,M,N	Government services	Public Administration and Defence, Education, Health and Social work
O,P	Personal services	Other Community, Social and Personal service activities, Activities of Private Households
TOT	Total Economy	Total Economy

Source: Author based on GGDC 10-sector database by Timmer et al. (2015).

.0.3 Aggregation of countries into regions

Major developed countries – G7
CAN, DEU, FRA, GBR, ITA, JPN, USA
Developed countries
AUS, AUT, BEL, BGR, BRA, CHE, CYP, CZE, DNK, ESP, EST, FIN, GRC, HRV, HUN, IRL, KOR, LTU, LUX, LVA, MLT, NLD, NOR, POL, PRT, ROU, SVK, SVN, SWE
Developing countries
CHN, IDN, IND, MEX, RUS, TUR, TWN

Source: Author based on the United Nations country classification.

.0.4 Classification of industries in accordance with the NACE Rev. 2

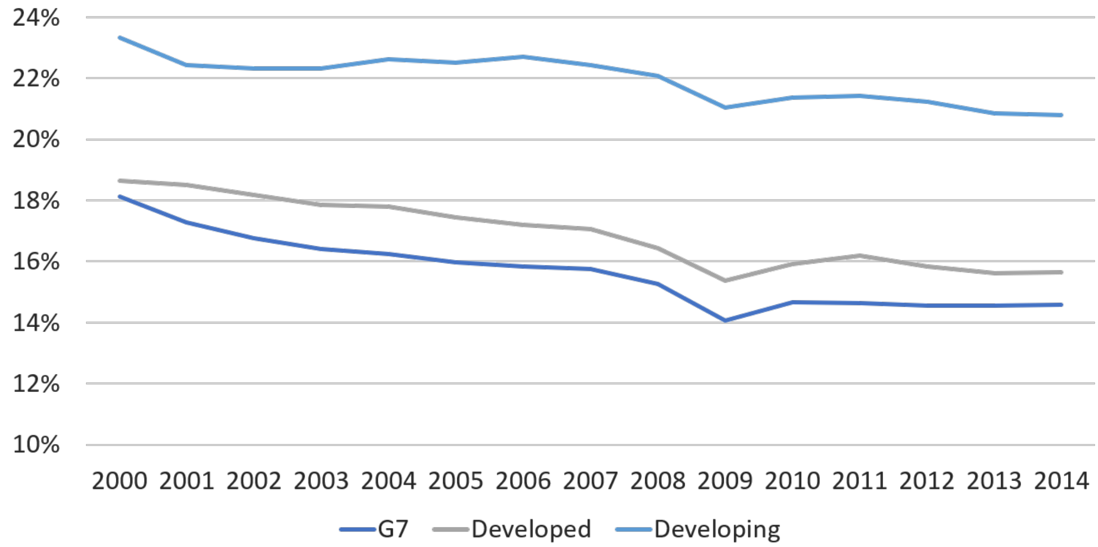
Manufacturing
Manufacture of food products, beverages and tobacco products
Manufacture of textiles, wearing apparel and leather products
Manufacture of wood and of products of wood and cork, except furniture
Manufacture of paper and paper products
Printing and reproduction of recorded media
Manufacture of coke and refined petroleum products
Manufacture of chemicals and chemical products
Manufacture of basic pharmaceutical products and pharmaceutical preparations
Manufacture of rubber and plastic products
Manufacture of other non-metallic mineral products
Manufacture of basic metals
Manufacture of fabricated metal products, except machinery and equipment
Manufacture of computer, electronic and optical products
Manufacture of electrical equipment
Manufacture of machinery and equipment n.e.c.
Manufacture of motor vehicles, trailers and semi-trailers
Manufacture of other transport equipment
Manufacture of furniture; other manufacturing
Repair and installation of machinery and equipment

Market services
Land transport and transport via pipelines
Water transport
Air transport
Warehousing and support activities for transportation

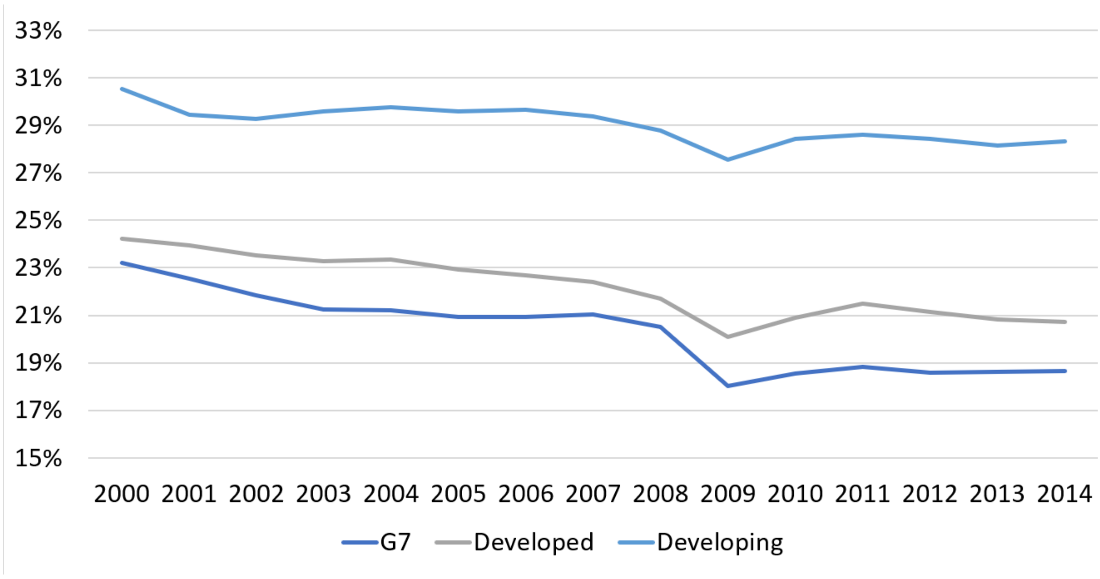
Postal and courier activities
Accommodation and food service activities
Publishing activities
Motion picture, video and television programme production, sound recording and music
Publishing activities; programming and broadcasting activities
Telecommunications
Computer programming, consultancy and related activities; information service activities
Financial service activities, except insurance and pension funding
Insurance, reinsurance and pension funding, except compulsory social security
Activities auxiliary to financial services and insurance activities
Real estate activities
Legal and accounting activities; activities of head offices; management consultancy activities
Architectural and engineering activities; technical testing and analysis
Scientific research and development
Advertising and market research
Other professional, scientific and technical activities; veterinary activities
Administrative and support service activities

Source: Author based on NACE Rev. 2.

.0.5 Development of share of direct and direct and indirect value added in manufacturing on the total value added in %

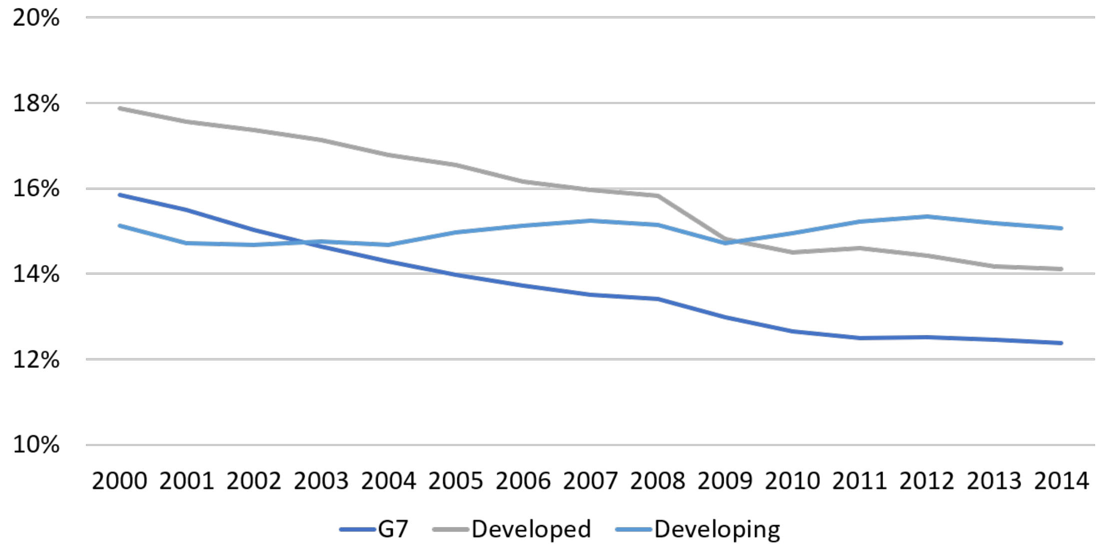


Source: Author's calculations based on data from WIOD.org.

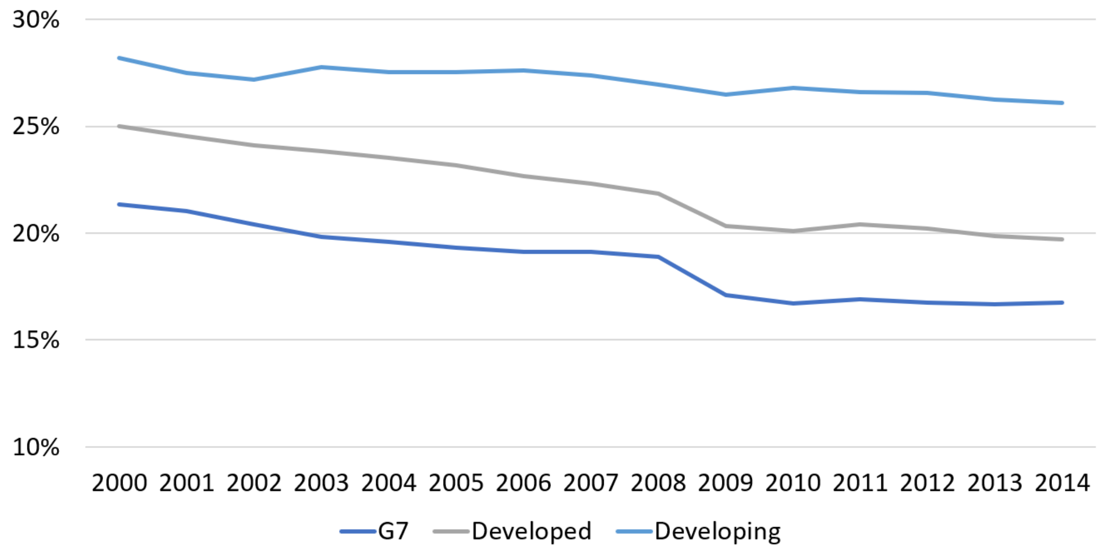


Source: Author's calculations based on data from WIOD.org.

.0.6 Development of share of direct and direct and indirect employment in manufacturing on the total employment in %



Source: Author's calculations based on data from WIOD.org.



Source: Author's calculations based on data from WIOD.org.

.0.7 Share of direct value added in manufacturing on the whole value added (in %)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
AUS	12.2	11.7	12.0	12.1	11.4	10.9	10.2	10.1	9.1	8.7	8.0	7.6	7.1	6.9	6.8
AUT	20.5	20.7	20.0	19.6	19.6	19.7	20.1	20.5	19.6	18.5	18.7	18.8	18.9	18.5	18.4
BEL	19.6	19.0	18.7	17.9	17.9	17.6	17.0	16.9	15.9	14.3	14.7	14.3	14.1	14.0	13.8
BGR	13.8	14.7	15.0	15.7	14.7	15.8	15.8	16.3	14.5	14.7	13.4	15.9	15.9	14.7	15.2
BRA	15.7	14.9	14.9	16.6	18.0	15.7	14.2	14.8	14.2	15.2	15.0	13.9	12.6	12.3	11.7
CAN	16.5	15.4	15.0	14.2	14.0	13.1	12.4	11.9	11.9	11.9	11.7	11.1	11.1	11.1	11.1
CHE	18.5	19.2	19.6	19.4	19.5	19.6	20.0	20.1	20.4	19.1	19.2	19.5	19.0	18.9	18.6
CHN	32.2	31.5	31.0	32.2	32.4	32.5	32.9	32.9	32.7	32.3	32.5	32.2	31.8	30.7	29.6
CYP	8.9	8.5	8.6	8.2	8.1	7.6	6.9	6.5	6.2	6.0	5.7	5.4	5.1	4.9	5.0
CZE	25.9	26.2	24.6	24.0	25.4	25.5	25.9	26.0	24.5	22.9	23.4	24.5	24.8	24.9	26.6
DEU	23.0	22.7	22.1	22.2	22.4	22.4	23.1	23.4	22.5	19.9	22.2	22.9	22.8	22.6	22.6
DNK	16.4	16.3	16.2	15.4	14.9	14.4	14.5	14.4	13.8	13.0	12.6	12.8	13.3	13.5	13.5
ESP	17.8	17.4	16.9	16.5	16.1	15.7	15.5	15.0	14.5	13.2	13.3	13.5	13.1	13.1	13.2
EST	17.3	17.9	17.7	17.7	16.9	16.6	16.4	15.9	15.4	14.1	15.7	16.6	15.9	15.6	15.9
FIN	27.6	26.9	26.1	25.2	24.6	24.3	25.1	25.3	23.7	19.1	19.5	18.9	16.9	16.9	16.7
FRA	15.7	15.2	14.7	14.2	13.8	13.3	12.8	12.7	12.1	11.5	11.3	11.4	11.3	11.3	11.2
GBR	15.7	14.5	13.7	12.8	12.1	11.8	11.3	10.7	10.7	10.1	10.3	10.3	10.3	10.8	10.6
GRC	10.6	11.2	11.0	10.2	9.7	9.6	9.5	9.6	9.6	8.5	8.2	8.9	9.1	9.6	9.4
HRV	17.8	17.7	17.3	16.6	16.3	15.6	15.2	15.2	15.1	14.4	14.2	14.4	14.5	14.1	14.5
HUN	22.4	22.2	21.4	21.6	22.0	22.0	22.7	22.3	21.4	20.3	21.7	22.1	22.4	22.6	23.5
IDN	26.9	27.9	27.8	27.0	26.9	26.3	26.2	25.4	26.1	24.4	22.6	22.2	21.9	21.6	21.5
IND	14.9	14.3	14.5	14.6	14.9	15.1	15.7	15.6	15.1	14.8	14.5	14.4	14.6	14.1	14.0
IRL	26.0	28.4	30.2	26.3	24.0	22.4	21.1	20.3	19.6	22.7	22.2	23.8	21.5	20.4	19.7
ITA	19.5	19.0	18.6	17.8	17.6	17.2	17.4	17.7	17.1	15.2	15.8	15.8	15.4	15.3	15.4
JPN	21.3	20.1	19.8	20.2	20.5	20.8	20.7	20.7	20.1	17.7	19.1	18.5	18.5	18.5	18.9
KOR	29.0	27.6	27.2	26.7	28.5	28.3	27.8	28.2	28.6	28.7	30.7	31.4	31.0	31.0	30.3
LTU	18.9	19.4	18.3	18.6	20.1	20.2	19.5	17.7	17.5	16.7	18.8	20.4	20.7	19.4	19.3
LUX	10.8	10.2	9.8	10.0	9.7	8.9	8.0	9.1	8.0	5.3	5.9	5.7	5.6	5.1	4.8
LVA	15.4	15.3	15.1	13.9	13.8	13.0	12.1	11.4	10.8	10.9	13.4	13.1	13.0	12.6	12.2
MEX	20.9	19.9	19.1	18.3	18.4	17.4	18.2	17.5	17.1	16.8	17.4	17.2	18.0	17.7	17.8
MLT	20.9	17.3	17.0	17.1	14.8	14.3	13.7	13.9	15.1	12.7	13.1	12.8	12.1	10.4	9.6
NLD	15.3	14.9	14.2	13.8	14.0	14.1	13.6	13.7	12.9	11.7	11.8	12.1	11.8	11.8	12.1
NOR	10.0	10.1	10.1	10.0	9.6	9.1	9.3	9.3	8.6	8.2	8.1	7.6	7.4	7.4	7.8
POL	18.0	16.6	16.2	17.7	19.1	18.4	19.0	18.8	18.6	18.3	17.5	18.1	18.0	18.8	19.6
PRT	17.2	16.7	16.2	15.4	14.9	14.5	14.3	14.1	13.7	12.6	13.2	12.9	13.0	13.1	13.3
ROU	22.1	24.3	24.1	22.8	23.4	23.8	23.6	22.1	21.5	21.6	23.9	24.5	22.6	23.0	21.7
RUS	20.8	18.5	17.6	16.3	17.4	18.3	17.9	17.6	17.4	15.0	15.2	16.3	15.6	14.9	14.3
SVK	23.9	24.8	22.4	23.0	23.5	23.6	23.5	23.3	22.3	17.7	20.8	21.1	20.9	20.3	20.9
SVN	24.9	25.0	24.8	24.8	24.5	23.6	23.4	23.3	21.9	19.6	20.2	21.0	21.6	22.5	23.1
SWE	23.0	21.9	21.3	20.8	20.7	20.5	20.6	20.5	19.1	17.3	18.6	18.3	17.2	16.8	16.4
TUR	21.2	20.1	19.5	19.8	19.5	19.4	19.3	18.6	17.8	16.6	17.4	18.2	17.4	17.3	17.8
TWN	26.4	24.8	26.8	28.1	28.8	28.6	28.5	29.2	28.2	27.4	29.9	29.5	29.2	29.6	30.7
USA	15.2	14.0	13.5	13.4	13.3	13.1	13.1	12.9	12.5	12.1	12.3	12.4	12.4	12.3	12.2

.0.8 Share of direct and indirect value added generated by final demand for manufacturing products on the whole value added (in %)

	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
AUS	14.9	14.1	13.8	13.8	13.2	12.5	12.1	12.3	11.0	10.5	10.1	9.3	8.8	8.3	8.0
AUT	24.9	25.3	25.0	24.4	24.6	25.0	25.6	26.1	25.4	23.1	24.2	24.7	24.7	24.0	23.8
BEL	28.2	27.6	27.6	26.7	27.0	26.4	26.4	26.3	24.9	21.3	20.1	20.3	19.6	19.4	18.9
BGR	24.4	24.1	23.7	24.3	23.8	24.8	24.7	24.2	21.6	22.3	22.7	25.4	25.0	23.9	23.8
BRA	25.3	25.2	25.4	27.8	29.4	28.2	27.1	26.9	26.8	24.7	24.1	23.4	22.7	22.4	21.3
CAN	22.5	21.2	20.8	19.4	19.3	18.2	17.1	16.3	15.4	15.1	15.1	14.8	14.5	14.6	15.0
CHE	20.1	20.4	20.8	20.7	21.2	21.2	22.0	22.5	22.9	21.0	21.9	22.0	21.3	21.2	20.9
CHN	32.8	31.8	31.8	33.9	35.7	37.2	38.1	38.0	37.7	35.2	36.2	36.1	35.6	35.4	34.7
CYP	9.1	9.2	9.5	8.9	7.8	7.4	6.6	6.0	5.8	6.3	5.9	5.3	5.5	5.0	5.2
CZE	30.1	31.1	30.1	30.1	32.6	33.5	34.1	34.4	33.0	30.5	31.6	33.2	33.8	34.2	35.8
DEU	31.0	31.2	30.7	31.0	31.4	31.7	32.7	33.9	33.1	28.7	31.2	32.6	32.1	32.0	31.6
DNK	20.0	20.0	19.4	18.6	18.3	18.2	18.1	18.1	17.9	16.6	16.6	17.3	17.9	17.8	18.0
ESP	21.4	20.9	20.0	19.4	19.0	18.4	18.1	18.0	18.0	16.4	16.7	17.3	17.5	17.8	17.6
EST	22.6	24.0	23.8	23.5	22.9	22.5	21.8	21.2	20.9	19.6	22.5	23.7	22.6	22.6	22.9
FIN	33.5	31.7	31.0	29.7	29.2	28.7	29.5	30.0	28.4	23.8	24.9	24.3	22.9	22.6	22.5
FRA	22.1	21.8	21.0	20.1	19.8	19.3	18.9	18.7	18.2	15.8	15.5	15.9	15.6	15.5	15.4
GBR	19.4	18.5	17.2	16.4	15.7	15.3	15.0	14.4	14.3	12.3	11.2	11.6	11.3	11.5	11.1
GRC	14.7	14.6	14.0	13.3	12.8	13.3	12.8	12.6	13.2	12.2	13.3	14.6	15.1	15.8	16.1
HRV	26.2	26.3	25.2	24.5	24.4	23.9	23.7	23.4	23.1	22.2	22.9	23.9	23.8	23.2	23.7
HUN	27.7	27.1	26.4	26.9	28.0	28.3	29.2	28.8	28.6	25.9	27.8	28.7	29.0	29.1	29.7
IDN	40.7	40.1	37.5	36.8	35.5	34.4	33.2	32.7	32.8	30.8	29.9	29.5	29.0	28.6	28.7
IND	26.4	25.3	26.8	28.2	28.5	27.9	28.4	27.4	26.5	26.8	27.2	27.5	27.3	27.0	27.0
IRL	33.8	34.3	35.6	31.3	29.0	27.7	25.9	25.4	24.6	27.0	25.3	26.0	23.4	22.2	21.8
ITA	28.8	28.2	27.5	26.7	26.6	26.2	26.4	27.2	26.8	22.7	22.7	23.2	23.0	23.0	23.2
JPN	22.2	21.4	20.8	21.0	21.6	21.7	22.1	22.6	21.9	18.7	20.4	19.5	19.1	19.0	19.8
KOR	34.4	32.8	32.0	31.6	33.5	32.7	31.7	31.4	33.0	33.4	35.8	37.4	36.8	36.3	35.1
LTU	27.7	27.4	24.8	25.1	26.3	26.3	24.9	22.9	23.0	21.3	24.4	26.9	26.9	25.5	25.0
LUX	11.8	11.2	11.1	10.7	10.7	9.7	8.8	9.7	8.5	5.9	6.4	6.1	5.8	5.1	4.9
LVA	21.7	21.2	21.5	21.3	20.4	19.3	17.6	16.0	14.5	15.0	18.6	18.4	18.1	17.8	17.1
MEX	28.8	27.5	26.9	26.3	26.3	26.0	26.0	25.7	25.4	25.1	25.6	25.3	26.2	26.0	26.2
MLT	25.0	21.3	20.9	20.8	18.5	17.0	15.8	15.2	15.0	12.6	13.5	12.8	12.1	10.8	9.6
NLD	22.4	22.3	21.5	21.0	21.2	21.4	21.0	21.2	20.5	17.0	15.9	16.5	16.4	15.1	15.4
NOR	13.6	13.7	13.5	13.3	13.0	12.8	13.5	13.7	12.7	12.2	11.5	11.3	11.3	11.1	11.6
POL	25.2	25.1	24.8	27.1	28.8	28.4	29.2	28.8	27.9	26.2	24.7	25.8	26.0	26.5	27.3
PRT	20.8	20.2	19.6	19.3	18.7	18.1	18.1	18.1	17.6	16.0	16.9	17.6	18.8	19.0	18.9
ROU	32.8	33.7	33.3	31.4	32.8	31.5	31.0	27.2	25.8	27.5	29.5	31.0	29.9	30.5	28.8
RUS	23.5	21.9	20.9	19.7	19.9	19.5	19.0	19.5	17.5	15.9	17.9	18.3	18.1	17.6	17.2
SVK	30.3	30.6	29.3	31.1	31.5	30.7	30.6	31.5	30.2	24.9	28.2	28.9	27.7	26.8	27.1
SVN	29.2	29.6	29.9	30.2	30.2	29.2	29.5	29.5	27.6	24.0	25.6	26.7	27.0	27.6	28.2
SWE	30.5	29.5	28.6	27.8	28.0	27.7	28.1	28.0	26.9	23.3	24.3	24.0	22.8	22.1	21.4
TUR	30.8	30.9	30.8	30.4	29.8	29.5	29.6	28.2	28.6	27.2	27.8	29.5	29.6	28.8	30.0
TWN	30.7	28.6	30.1	31.9	32.7	32.8	33.3	34.0	32.9	31.8	34.5	34.0	33.4	33.6	34.4
USA	16.6	15.5	14.8	14.3	14.1	14.1	14.1	14.1	13.8	12.9	13.7	14.2	14.4	14.6	14.6

.0.9 Share of value added generated by the final demand for manufacturing products in market services (in %)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
AUS	22.1	21.8	22.5	22.7	22.5	21.7	22.7	22.6	22.3	23.6	22.9	23.4	23.6	23.7	24.5
AUT	14.6	14.7	15.7	15.7	16.0	16.2	16.3	16.6	17.6	16.8	16.9	17.0	16.7	17.1	17.2
BEL	20.7	20.8	19.9	19.9	20.1	20.0	21.3	21.2	21.5	21.6	21.2	23.1	22.4	22.5	22.2
BGR	15.6	16.1	16.8	16.2	17.2	17.0	17.1	19.1	18.0	18.6	20.9	19.5	19.1	19.3	19.0
BRA	20.9	21.8	21.6	20.8	19.2	21.8	22.6	22.2	21.9	20.8	21.1	20.9	21.9	22.3	23.2
CAN	18.7	19.9	19.8	19.5	19.3	19.5	19.7	20.0	20.4	19.0	18.4	18.4	18.4	18.5	18.9
CHE	12.4	11.3	11.6	11.7	11.7	11.3	11.0	11.2	11.1	12.0	11.9	11.8	11.9	12.0	12.2
CHN	12.9	13.3	13.5	13.2	13.3	14.0	14.3	14.7	14.2	15.1	14.6	14.3	15.0	15.8	16.7
CYP	12.6	13.3	12.8	12.1	11.0	11.5	13.1	12.7	13.0	14.1	13.0	13.9	13.4	14.1	15.0
CZE	10.8	11.2	12.7	13.9	13.8	13.8	13.7	14.3	14.6	14.6	14.5	14.1	13.6	13.9	13.2
DEU	23.0	23.4	23.8	23.8	23.6	24.0	23.9	24.4	24.8	24.0	22.4	22.3	22.0	22.3	22.2
DNK	14.0	14.7	14.7	14.9	15.1	16.0	14.9	15.0	16.1	17.9	16.1	15.8	14.8	14.8	14.9
ESP	15.3	16.1	16.5	16.8	17.2	17.5	18.0	18.8	19.2	20.5	21.2	21.5	22.0	21.8	22.1
EST	18.9	18.7	18.5	17.7	18.0	17.5	17.2	16.6	17.5	18.6	18.6	18.5	18.0	18.5	18.5
FIN	19.1	18.9	18.8	18.5	18.7	19.0	18.6	18.2	18.7	20.1	18.7	19.5	20.9	19.7	20.0
FRA	25.9	26.5	26.4	26.4	26.9	27.6	28.8	29.0	29.6	26.1	25.6	25.3	24.8	24.7	24.8
GBR	16.1	16.7	17.4	17.6	17.9	17.6	18.0	18.6	18.1	18.8	18.3	18.4	18.4	18.1	18.5
GRC	18.2	17.9	18.6	18.1	19.2	22.2	23.1	22.2	21.8	24.5	26.1	24.8	25.7	24.6	24.4
HRV	12.1	11.8	11.2	11.9	12.6	13.6	14.6	15.3	15.2	16.0	16.3	16.9	16.7	16.6	16.4
HUN	14.9	15.1	16.4	16.6	16.9	18.1	17.7	17.9	18.7	17.6	16.7	16.1	15.4	14.7	14.3
IDN	7.9	8.7	9.5	11.0	10.4	10.3	9.7	8.2	7.4	7.2	6.8	6.5	6.7	7.0	7.4
IND	15.5	16.5	17.0	18.2	18.4	17.8	16.9	16.2	16.5	17.7	16.6	17.1	16.8	17.2	18.1
IRL	10.9	9.3	8.1	8.9	9.8	12.4	12.4	13.3	13.3	12.7	11.6	8.2	7.6	8.9	8.8
ITA	24.4	25.0	25.5	26.4	26.5	27.0	27.0	27.4	28.1	27.9	27.1	27.2	28.1	28.3	28.2
JPN	16.8	18.1	17.8	17.4	17.0	16.6	17.2	17.7	18.4	19.1	17.8	18.0	17.5	17.1	17.0
KOR	15.3	16.2	17.2	17.9	17.4	17.6	16.8	16.3	16.6	16.7	15.9	15.9	15.6	15.3	15.4
LTU	15.5	14.5	14.1	13.4	12.9	13.2	13.5	14.4	15.2	16.4	15.6	14.9	13.7	14.4	14.0
LUX	9.1	9.3	9.8	8.3	8.8	8.6	8.7	6.9	7.4	10.8	9.7	9.6	7.2	6.7	6.7
LVA	16.2	16.0	16.7	19.0	17.8	18.3	17.5	16.9	17.4	16.8	16.2	17.5	18.0	18.3	18.2
MEX	12.1	12.2	12.9	13.6	12.9	13.6	12.9	13.2	13.1	14.2	13.4	12.7	12.6	13.3	13.2
MLT	10.3	11.3	9.9	9.3	10.6	9.6	8.5	8.3	6.0	6.6	6.5	6.2	6.8	7.5	8.4
NLD	20.7	20.2	18.9	19.2	20.5	20.8	20.9	21.7	21.5	20.9	20.7	20.8	21.3	20.3	19.6
NOR	15.9	16.4	16.4	16.2	16.3	16.3	16.1	17.3	17.0	17.4	16.0	15.6	15.3	15.8	15.6
POL	14.7	15.7	16.0	16.1	15.2	15.8	15.6	15.9	15.9	15.0	15.4	15.5	15.9	15.2	15.5
PRT	14.1	14.2	14.2	15.0	15.3	15.7	16.2	17.0	17.7	17.0	17.1	17.7	17.8	17.0	16.5
ROU	10.4	9.0	9.5	9.1	9.2	9.6	9.9	11.0	10.2	11.5	12.1	12.2	13.8	16.0	15.4
RUS	7.0	8.6	9.1	10.6	10.2	10.0	10.1	11.2	10.7	12.0	12.3	11.2	11.5	12.2	13.5
SVK	14.9	14.3	16.0	16.0	14.2	13.5	12.6	13.8	13.9	16.4	15.8	13.7	14.2	14.3	13.4
SVN	15.6	15.4	15.5	15.6	15.7	15.6	16.2	16.0	16.0	16.4	17.2	16.8	15.8	15.3	15.1
SWE	22.5	23.0	22.6	22.2	22.2	22.9	22.7	22.7	23.5	21.8	19.0	19.9	20.4	20.4	20.3
TUR	17.5	20.2	18.1	16.9	16.6	16.2	17.0	17.6	18.9	20.3	19.1	18.8	20.3	20.0	20.7
TWN	11.8	12.2	10.9	10.5	10.2	10.3	10.7	10.2	10.1	8.6	8.0	7.9	8.0	7.3	6.9
USA	19.8	21.4	21.5	20.4	19.4	20.2	19.4	19.3	18.8	18.5	18.6	18.4	19.4	19.4	20.1

.0.10 Share of direct employment in manufacturing on the whole employment (in %)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
AUS	11.6	11.4	11.1	10.9	10.4	10.0	9.9	9.9	9.1	8.8	8.5	8.2	7.8	7.9	7.7
AUT	17.4	17.3	16.9	16.7	16.5	16.3	16.0	16.1	15.9	15.3	14.9	15.0	15.0	14.9	14.7
BEL	15.9	15.9	15.4	14.9	14.5	14.1	13.9	13.5	13.3	12.6	12.1	12.0	11.8	11.5	11.3
BGR	19.7	19.4	19.7	19.1	19.1	19.0	18.9	18.9	19.1	17.2	17.0	17.2	17.4	16.9	17.9
BRA	12.3	12.0	12.2	12.7	12.6	13.2	12.3	12.7	13.0	12.6	12.0	12.0	12.1	12.1	11.4
CAN	13.2	12.8	12.5	12.1	12.0	11.6	11.1	10.6	11.0	11.4	11.1	10.4	10.4	10.8	10.9
CHE	17.2	16.9	16.3	15.7	15.4	15.5	15.7	15.7	15.5	14.9	14.6	14.5	14.3	14.0	13.9
CHN	15.3	14.8	14.1	14.0	14.7	15.8	16.7	17.9	18.7	19.0	18.9	20.5	20.8	20.4	19.6
CYP	11.4	10.6	10.2	10.1	10.0	9.7	9.6	9.4	9.2	9.0	9.1	8.7	8.4	7.9	7.9
CZE	27.4	27.5	27.3	26.7	27.0	27.3	27.1	27.3	26.9	25.3	24.8	25.7	25.8	25.7	26.1
DEU	19.6	19.7	19.4	19.1	18.7	18.4	18.1	18.0	18.3	17.8	17.4	17.5	17.6	17.6	17.5
DNK	14.6	14.6	14.1	13.7	13.2	12.8	12.4	12.5	12.4	11.2	10.5	10.5	10.4	10.3	10.3
ESP	17.3	16.7	16.1	15.6	15.1	14.5	13.7	13.1	12.9	12.0	11.8	11.6	11.3	11.2	11.1
EST	21.9	22.1	21.6	21.7	22.3	22.0	20.4	19.8	20.3	19.0	18.9	19.9	18.6	18.8	18.4
FIN	19.2	19.0	18.4	17.9	17.3	17.1	16.9	16.8	16.6	15.3	14.7	14.7	14.5	14.0	13.7
FRA	13.6	13.5	13.2	12.9	12.5	12.2	11.8	11.5	11.3	10.9	10.4	10.3	10.1	10.0	9.9
GBR	13.8	13.1	12.3	11.5	10.9	10.3	10.0	9.6	9.3	8.8	8.6	8.5	8.4	8.3	8.1
GRC	10.4	10.8	10.6	10.3	10.0	10.2	10.1	9.9	10.2	9.8	9.2	8.9	8.8	8.5	8.4
HRV	22.2	21.3	21.2	20.9	20.3	20.5	19.3	19.2	18.6	17.3	16.6	17.2	17.5	17.1	17.5
HUN	23.0	23.5	23.6	22.7	22.0	21.3	21.2	21.0	21.2	20.4	20.1	20.8	20.1	18.8	19.2
IDN	11.5	12.1	12.0	12.0	11.2	12.0	11.4	11.4	11.7	11.6	11.8	12.0	11.7	11.5	11.3
IND	11.0	11.0	11.1	11.2	11.3	11.1	10.9	10.6	10.4	10.2	10.6	11.3	13.1	12.6	12.8
IRL	17.2	16.8	15.8	15.1	14.3	13.3	12.7	12.2	11.8	11.6	11.4	11.5	11.4	11.4	11.1
ITA	19.9	19.5	19.2	19.1	18.8	18.5	18.3	18.2	18.0	17.4	16.8	16.6	16.4	16.2	16.2
JPN	18.9	18.5	17.8	17.5	17.1	16.9	17.1	17.1	16.9	16.1	15.9	15.8	16.1	15.9	15.8
KOR	18.5	17.9	17.5	17.3	16.9	16.4	15.8	15.5	15.3	15.4	15.6	15.2	14.7	14.7	15.2
LTU	17.3	17.0	17.7	17.7	17.2	17.9	17.3	16.8	17.0	15.8	15.4	15.6	15.7	15.4	15.1
LUX	13.0	12.5	11.8	11.8	11.5	11.2	10.7	10.2	9.8	9.4	9.2	9.0	8.7	8.2	7.8
LVA	16.0	16.5	16.9	17.1	16.7	16.3	15.6	14.6	14.4	13.0	13.8	14.0	14.5	14.2	13.4
MEX	16.3	15.6	14.8	15.1	14.6	14.7	14.4	14.1	13.4	12.7	12.8	12.8	12.7	12.8	12.9
MLT	23.3	21.4	20.9	20.4	17.5	17.1	16.8	17.1	17.2	14.2	15.3	15.2	15.0	12.8	12.1
NLD	11.6	11.3	11.0	10.7	10.4	10.2	9.9	9.6	9.5	9.3	9.1	9.0	8.9	8.9	8.8
NOR	12.2	11.6	11.3	11.1	10.5	10.6	10.9	10.8	10.6	10.1	9.9	9.7	9.3	9.5	9.3
POL	19.6	17.9	17.5	19.1	19.4	19.7	20.0	20.2	20.4	19.3	18.6	18.7	18.6	19.0	20.0
PRT	20.4	19.9	19.3	18.7	18.0	17.3	17.0	16.6	16.1	15.1	14.9	14.9	15.0	15.1	15.3
ROU	18.6	18.6	22.2	21.6	22.9	21.8	21.7	20.8	20.3	18.7	17.5	18.0	17.4	17.6	17.8
RUS	15.6	15.3	15.0	15.5	15.2	14.8	14.7	14.5	14.0	13.0	13.1	13.7	13.7	13.4	12.1
SVK	24.5	24.5	24.1	24.5	24.1	23.7	23.7	23.7	23.9	21.8	21.3	21.7	21.6	21.4	21.6
SVN	27.2	27.1	26.3	25.8	25.5	25.1	24.3	23.7	23.0	21.2	20.3	20.6	20.5	20.3	20.0
SWE	17.2	17.1	16.6	16.3	15.7	15.5	15.1	15.1	15.0	13.9	13.5	13.4	13.0	12.6	12.3
TUR	17.7	16.9	17.5	17.3	17.2	18.2	19.3	19.7	20.0	18.2	18.7	18.0	17.4	17.4	17.9
TWN	18.4	17.4	18.1	18.3	18.5	18.3	18.5	18.5	17.9	18.3	18.8	18.2	18.0	18.1	18.8
USA	11.9	11.4	10.7	10.3	10.0	9.8	9.6	9.4	9.2	8.5	8.3	8.4	8.4	8.3	8.3

.0.11 Share of direct and indirect employment generated by final demand for manufacturing products on the employment (in %)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
AUS	13.6	12.9	12.4	12.2	11.6	11.0	10.8	11.0	10.0	9.8	9.4	8.9	8.4	8.3	8.1
AUT	22.9	23.1	23.0	22.6	22.6	22.7	22.5	22.6	22.5	20.9	21.3	21.6	21.4	21.1	21.0
BEL	26.0	25.7	25.1	24.4	24.2	23.5	23.8	23.6	23.0	20.2	17.9	18.4	17.7	17.3	16.8
BGR	29.8	28.6	28.9	27.8	28.0	28.0	27.4	27.2	25.6	25.6	26.1	26.2	26.3	25.4	25.8
BRA	27.9	27.6	27.8	29.1	29.6	30.2	29.0	28.4	28.1	26.3	25.2	24.2	23.8	23.5	22.8
CAN	20.2	19.4	19.0	17.9	17.8	17.0	15.9	15.1	14.6	14.3	14.0	13.6	13.4	13.7	14.4
CHE	19.7	19.3	19.0	18.6	18.6	18.5	18.9	19.1	19.1	18.0	18.3	18.1	17.6	17.4	17.2
CHN	25.8	24.9	24.8	26.7	28.5	31.0	32.8	33.8	33.8	32.6	32.7	32.9	32.7	32.5	31.5
CYP	11.6	11.3	11.3	10.8	9.9	9.5	8.9	8.4	8.0	8.9	8.4	7.2	7.8	6.6	6.6
CZE	31.7	32.5	32.4	32.5	34.1	35.0	35.0	35.5	34.7	32.7	32.9	34.4	34.8	35.0	35.6
DEU	27.3	27.7	27.5	27.3	27.3	27.4	27.5	28.1	28.2	26.1	26.6	27.6	27.4	27.4	27.1
DNK	17.5	17.6	17.0	16.6	16.2	16.0	15.3	15.4	15.6	14.3	13.7	13.9	13.8	13.7	13.9
ESP	21.6	21.1	20.1	19.4	19.0	18.3	17.5	17.2	17.6	16.0	15.7	16.1	16.2	16.4	16.1
EST	25.9	26.6	26.1	25.8	26.3	26.0	24.5	23.8	24.3	23.2	24.0	25.0	23.7	24.2	23.8
FIN	26.8	25.6	24.9	24.0	23.4	23.2	23.4	23.5	22.9	20.8	20.8	20.7	20.6	19.8	19.7
FRA	20.3	20.4	19.8	19.1	18.9	18.6	18.3	18.0	17.7	15.4	14.6	14.8	14.4	14.2	14.1
GBR	18.0	17.3	16.3	15.4	14.7	14.2	13.8	13.5	13.1	10.9	9.3	9.6	9.4	9.2	8.9
GRC	16.5	16.8	15.5	15.0	14.3	15.3	14.8	14.1	14.3	14.0	14.4	15.3	15.7	16.0	16.4
HRV	31.1	30.7	29.3	28.4	28.3	27.8	27.1	26.7	26.0	25.0	25.4	27.1	26.6	25.1	25.6
HUN	29.2	29.0	29.1	28.1	27.8	27.3	27.3	26.9	27.3	25.4	25.8	26.6	26.2	25.2	25.4
IDN	34.2	32.9	30.6	31.3	29.1	29.0	27.8	27.4	27.9	28.1	27.2	26.7	26.2	25.7	26.0
IND	25.8	25.0	26.9	28.3	28.6	27.5	27.5	26.6	25.9	26.0	26.4	27.0	27.3	26.7	26.8
IRL	28.2	27.1	26.1	24.3	23.3	22.3	20.7	20.4	20.0	17.1	13.6	13.5	12.7	13.0	12.8
ITA	28.3	28.0	27.6	27.3	27.1	27.0	27.1	27.4	27.3	24.1	23.0	23.2	23.1	23.1	23.2
JPN	21.4	21.2	20.4	20.2	20.1	19.9	20.3	20.8	20.7	19.1	19.4	19.0	18.8	18.4	18.7
KOR	30.3	29.5	28.6	28.2	28.3	27.4	26.2	25.5	26.5	27.2	27.6	28.1	27.3	27.0	26.4
LTU	29.5	27.9	27.2	26.8	25.4	25.0	24.0	22.2	21.8	20.7	21.4	22.1	21.6	21.4	21.4
LUX	14.3	13.6	13.2	12.6	12.6	12.1	11.7	11.0	10.4	9.9	9.4	9.1	8.5	8.0	7.6
LVA	23.9	24.1	24.5	25.7	23.5	22.7	22.0	19.6	18.1	17.3	18.9	19.3	19.4	19.4	18.3
MEX	29.7	29.2	28.7	28.3	27.5	27.5	26.7	26.3	24.9	25.1	25.1	24.0	24.7	25.0	24.9
MLT	26.7	24.6	24.3	23.8	21.0	19.7	18.4	17.9	17.1	14.2	15.3	15.0	14.6	12.9	11.7
NLD	20.5	20.1	19.1	18.7	19.1	19.0	18.7	18.8	18.3	14.7	12.9	13.2	13.2	12.2	12.2
NOR	16.9	16.7	16.1	15.6	15.0	15.1	15.3	15.3	14.6	13.6	12.8	12.6	12.3	12.0	11.8
POL	29.7	29.5	28.9	31.1	32.0	31.9	32.1	31.9	31.1	28.4	27.4	28.2	28.0	28.0	28.8
PRT	25.4	25.1	24.3	24.5	23.6	22.9	22.8	22.7	22.2	20.7	20.8	21.6	22.6	23.2	23.0
ROU	40.2	37.8	38.6	37.8	38.0	37.4	36.1	34.7	32.2	31.7	30.6	31.4	32.0	32.6	32.2
RUS	22.7	22.4	21.7	21.8	21.1	20.6	20.2	20.1	18.7	18.3	20.1	20.0	19.9	19.4	18.0
SVK	29.9	29.9	30.2	31.6	31.1	30.3	30.2	31.0	30.6	27.5	27.8	28.8	28.0	27.3	27.0
SVN	32.3	32.6	32.3	32.0	31.8	31.1	30.7	30.2	28.7	25.9	26.0	26.5	26.4	26.2	26.2
SWE	25.0	24.7	23.9	23.3	22.9	22.7	22.6	22.4	22.3	19.8	19.3	19.2	18.8	18.2	17.6
TUR	34.4	34.8	34.5	33.8	33.7	33.0	33.7	32.6	33.2	31.1	31.3	31.5	31.4	30.7	31.6
TWN	24.8	23.1	23.2	24.1	24.2	24.1	24.8	24.9	24.2	24.1	24.8	24.2	23.8	23.7	23.8
USA	13.8	13.2	12.4	11.6	11.2	11.3	11.0	10.9	10.4	9.7	10.0	10.4	10.7	10.7	10.7

.0.12 Share of employment generated by the final demand for manufacturing products in market services (in %)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
AUS	21.8	20.8	22.1	22.2	22.4	22.1	22.1	21.5	21.6	22.4	22.2	22.0	21.8	21.1	22.2
AUT	13.7	14.0	14.7	14.7	15.5	15.8	16.5	17.2	17.7	16.6	17.5	17.6	17.8	17.6	17.5
BEL	22.4	22.0	22.0	22.1	22.9	22.7	24.0	24.5	24.4	23.7	25.1	26.7	26.2	26.6	26.5
BGR	7.6	7.6	7.5	7.7	8.0	8.3	8.5	8.3	7.9	8.8	9.3	10.2	10.2	10.5	10.2
BRA	13.1	13.9	13.9	14.3	14.5	14.3	15.2	15.5	15.9	15.2	14.3	14.8	15.4	16.0	16.0
CAN	24.5	24.9	24.9	24.5	24.6	24.4	24.8	25.6	25.6	24.1	24.4	25.1	24.8	24.2	23.8
CHE	13.0	12.9	14.0	14.6	15.0	14.7	14.9	15.2	16.0	16.2	16.7	16.9	16.9	17.1	17.4
CHN	8.7	8.8	9.1	9.6	10.2	10.9	10.7	10.2	10.2	10.6	10.7	10.7	11.3	11.9	13.0
CYP	7.5	7.9	7.9	7.4	6.3	6.4	6.8	6.2	6.4	6.6	5.6	6.3	5.9	6.5	7.3
CZE	8.2	8.7	9.7	10.4	11.0	11.2	11.4	11.7	11.5	11.3	11.5	11.5	11.4	11.6	11.5
DEU	20.7	21.0	21.2	21.8	22.5	23.4	24.5	25.5	25.3	23.5	24.6	25.0	24.5	24.6	24.5
DNK	14.8	15.4	15.4	15.4	15.7	16.7	16.5	16.8	16.9	18.4	18.1	18.4	18.0	18.1	18.3
ESP	11.7	12.7	13.4	13.9	14.5	15.3	16.3	17.0	17.8	19.9	22.6	23.1	23.5	23.8	23.8
EST	11.8	11.5	11.7	11.2	10.1	10.9	11.3	10.6	10.5	11.8	12.7	13.6	13.5	13.6	13.9
FIN	22.8	22.0	22.4	22.2	22.7	23.3	24.2	24.3	24.1	23.3	23.8	24.3	24.1	23.7	23.9
FRA	26.1	26.6	26.4	26.0	26.5	27.0	27.9	28.3	28.5	24.8	25.1	25.8	25.6	25.5	25.8
GBR	16.8	17.4	17.6	17.9	18.0	18.4	18.7	19.1	19.2	20.1	21.4	21.8	22.1	22.9	23.0
GRC	10.7	10.9	11.4	10.9	11.5	12.4	12.5	11.8	12.4	12.7	13.7	14.1	14.7	15.1	15.4
HRV	4.4	4.6	4.5	5.0	5.4	5.7	6.3	6.6	6.7	7.2	8.2	8.6	8.6	9.0	8.9
HUN	8.9	8.9	9.5	10.7	12.2	13.2	13.3	13.7	14.1	13.1	13.3	13.5	13.0	13.9	14.0
IDN	6.0	6.1	5.9	6.4	6.2	5.7	6.0	5.9	5.9	5.4	4.9	5.0	5.0	5.3	5.6
IND	4.9	5.2	5.2	5.7	6.1	6.4	6.2	6.2	6.3	7.1	7.0	7.3	7.0	7.2	7.7
IRL	12.6	11.8	12.2	11.7	12.3	14.0	13.9	14.6	14.0	17.1	16.0	11.6	10.0	11.1	10.9
ITA	19.4	19.9	20.1	20.3	20.7	21.1	21.5	22.2	22.7	21.1	21.8	22.5	23.5	23.8	23.9
JPN	16.3	17.2	17.3	17.6	18.2	18.4	19.2	19.9	20.5	19.9	20.3	20.0	19.4	19.5	19.7
KOR	16.4	17.6	18.1	19.0	21.0	21.5	21.8	22.2	22.6	23.6	24.8	26.4	26.8	27.3	26.0
LTU	8.0	7.6	7.1	6.6	7.0	7.6	7.0	8.4	10.1	10.4	11.7	12.5	12.2	12.1	11.9
LUX	7.9	8.2	8.6	7.2	7.8	6.8	7.4	7.0	6.4	6.2	6.9	6.7	4.8	4.2	4.3
LVA	8.4	7.3	7.6	8.6	8.9	9.3	8.8	10.0	9.8	10.5	11.8	12.4	12.5	12.9	13.2
MEX	3.8	3.6	3.8	3.8	3.7	3.9	3.8	4.0	4.2	4.5	4.5	4.5	4.4	4.6	4.7
MLT	6.9	7.0	6.2	6.0	6.8	5.9	5.1	4.9	3.9	5.5	5.8	4.1	4.3	4.9	5.5
NLD	24.8	24.4	23.3	23.5	24.7	25.6	26.3	27.6	27.1	25.8	25.0	25.8	25.9	24.2	24.3
NOR	12.9	13.2	13.1	12.8	13.2	13.6	14.4	15.3	15.6	14.4	13.3	13.7	13.6	13.7	14.1
POL	8.1	8.7	9.3	9.4	9.9	10.0	10.6	10.8	10.5	10.7	11.4	11.8	12.1	12.2	12.5
PRT	8.8	8.6	8.8	9.1	9.5	10.0	10.3	10.6	11.0	10.8	11.7	12.3	12.8	12.7	12.4
ROU	3.6	3.6	4.1	3.9	4.6	4.5	4.7	4.5	4.4	5.5	5.8	5.8	6.4	6.8	6.3
RUS	5.0	5.5	5.6	5.7	6.1	6.2	6.3	7.0	6.5	6.6	7.1	7.3	7.3	7.8	9.1
SVK	11.9	11.1	11.4	12.0	11.9	11.7	11.8	12.6	12.3	13.1	14.7	12.5	13.7	13.5	12.8
SVN	11.6	11.9	13.1	13.3	13.5	13.1	13.8	14.3	13.9	13.8	15.5	15.7	15.7	15.8	15.9
SWE	24.2	24.4	24.1	23.8	24.4	24.9	25.4	25.9	25.9	23.5	23.3	23.6	23.2	23.2	23.2
TUR	4.5	4.7	4.6	4.6	4.6	4.7	4.9	5.3	5.4	6.6	6.6	6.9	7.5	7.4	7.8
TWN	12.2	13.2	13.2	12.8	12.5	12.6	13.0	12.3	11.8	10.6	10.2	10.2	10.1	9.4	9.1
USA	24.3	25.1	25.4	24.7	24.0	24.6	24.3	24.5	23.9	23.8	25.2	25.3	26.3	27.0	27.6

.0.13 Structural decomposition analysis of changes in the overall manufacturing employment, cumulative changes for 2014 - 2000, in %

	Man. employment growth index	Changes in the stucture of production	Changes in the use of domestic intermediates (offshoring/outsourcing)	Changes in the use of domestic intermediates (insourcing)	Changes in the manufacturing final demand structure	Changes in the share of man. expend. on total final demand	Changes in the final demand structure	Common growth of labour productivity and final demand volume
AUS	0.777	0.995	0.940	1.009	0.994	0.590	0.958	1.464
AUT	1.041	1.052	0.920	1.018	0.990	0.914	1.130	1.034
BEL	0.714	1.021	0.818	1.014	0.910	0.768	1.058	1.140
BGR	0.939	0.847	0.893	1.024	1.110	0.761	1.255	1.143
BRA	1.050	1.009	0.967	1.008	0.981	0.874	1.016	1.226
CAN	0.869	1.002	0.972	1.054	0.942	0.796	0.871	1.297
CYP	0.640	1.033	0.955	1.020	0.961	0.537	1.024	1.202
CZE	1.181	1.068	0.837	1.008	0.952	0.997	1.274	1.085
DEU	1.061	1.044	0.891	1.009	0.994	0.899	1.173	1.078
DNK	0.801	1.070	0.889	1.004	0.953	0.876	1.061	0.948
ESP	0.803	1.010	0.904	1.044	0.971	0.833	1.068	0.975
EST	0.964	0.999	0.926	1.010	0.907	0.817	1.389	1.003
FIN	0.798	1.095	0.878	1.008	0.994	0.834	0.918	1.082
FRA	0.738	1.025	0.892	1.009	1.011	0.734	1.001	1.078
GBR	0.556	0.990	0.897	1.027	0.952	0.613	1.013	1.032
GRC	0.913	0.908	0.964	1.024	0.882	1.097	1.028	1.023
HRV	0.808	0.916	0.946	1.008	0.976	0.899	1.048	1.005
HUN	0.868	1.014	0.846	1.010	0.919	0.893	1.166	1.047
CHE	1.108	1.003	0.953	1.036	0.931	0.949	1.059	1.197
CHN	1.457	1.093	0.968	1.073	0.919	1.028	1.019	1.335
IDN	1.325	0.937	0.977	1.040	1.049	0.829	0.877	1.825
IND	1.671	0.949	0.977	1.013	0.904	1.044	1.026	1.837
IRL	0.506	0.829	0.743	1.029	0.958	0.588	1.123	1.261
ITA	0.866	1.017	0.939	1.016	0.973	0.791	1.078	1.076
JPN	0.819	1.014	0.915	1.003	0.944	0.846	1.150	0.958
KOR	1.168	1.072	0.964	1.049	0.922	0.882	1.119	1.184
LTU	0.683	0.815	0.876	1.002	0.820	0.824	1.325	1.067
LUX	0.822	1.041	0.909	1.014	1.017	0.440	1.027	1.866
LVA	0.746	1.036	0.908	1.004	0.979	0.646	1.272	0.981
MEX	1.029	0.966	0.919	1.008	1.048	0.875	1.014	1.236
MLT	0.563	1.032	0.939	1.025	1.074	0.263	1.115	1.801
NLD	0.632	0.904	0.774	1.024	0.964	0.733	1.167	1.071
NOR	0.826	0.973	0.918	1.025	0.949	0.960	0.920	1.076
POL	1.021	0.978	0.945	1.018	0.928	0.917	1.233	1.034
PRT	0.816	0.987	0.932	1.002	0.961	0.806	1.209	0.946
ROU	0.659	0.871	0.935	1.024	0.909	0.888	1.027	0.953
RUS	0.796	0.988	0.973	1.056	0.931	0.766	1.000	1.099
SVK	0.999	0.984	0.845	1.004	0.914	0.766	1.389	1.231
SVN	0.843	1.010	0.875	1.004	1.045	0.634	1.411	1.017
SWE	0.779	1.023	0.930	1.026	1.005	0.750	0.986	1.074
TUR	1.304	0.964	0.834	1.023	0.959	0.965	1.060	1.615
TWN	1.149	0.974	0.943	1.057	0.898	0.973	1.115	1.215
USA	0.805	1.007	0.954	1.003	0.947	0.868	1.044	0.973

.0.14 Structural decomposition analysis of changes in the overall manufacturing employment, cumulative changes for 2000 - 2007, in %

	Man. employment growth index	**Changes in the stucture of production**	**Changes in the use of domestic intermediates (offshoring/outsourcing)**	**Changes in the use of domestic intermediates (insourcing)**	**Changes in the manufacturing final demand structure**	**Changes in the share of man. expend. on total final demand**	**Changes in the final demand structure**	**Common growth of labour productivity and final demand volume**
AUS	0.961	0.977	0.980	1.021	0.960	0.876	0.961	1.216
AUT	1.053	1.025	0.954	1.013	0.987	0.972	1.114	0.995
BEL	0.967	1.003	0.947	1.027	0.936	0.959	1.022	1.079
BGR	1.051	0.892	0.902	1.015	1.053	0.860	1.159	1.229
BRA	1.228	1.002	0.987	1.017	0.959	1.030	1.044	1.185
CAN	0.848	1.022	0.980	1.034	0.967	0.802	0.915	1.155
CYP	0.894	10.253	0.096	1.014	0.925	0.741	0.997	1.307
CZE	1.175	1.055	0.916	1.013	0.958	1.054	1.144	1.038
DEU	1.040	1.018	0.952	1.006	0.998	0.961	1.151	0.965
DNK	0.926	1.058	0.950	1.003	0.976	0.872	1.052	1.027
ESP	1.015	1.061	0.992	1.035	0.995	0.866	0.972	1.112
EST	1.011	0.987	0.953	1.019	0.911	0.804	1.215	1.183
FIN	0.954	1.019	0.937	1.008	0.988	0.929	1.008	1.073
FRA	0.931	1.044	0.949	1.007	1.001	0.895	0.982	1.062
GBR	0.800	1.044	0.951	1.006	0.967	0.789	0.992	1.057
GRC	0.952	0.926	0.956	1.011	0.949	0.864	1.009	1.287
HRV	0.922	0.938	0.961	1.006	0.978	0.930	0.993	1.125
HUN	0.914	1.001	0.919	1.007	0.916	0.921	1.089	1.073
CHE	1.063	0.989	0.964	1.015	0.942	1.027	1.073	1.059
CHN	1.404	1.037	0.947	1.029	0.942	1.003	1.134	1.297
IDN	0.938	0.935	0.987	1.054	0.964	0.886	0.929	1.215
IND	1.158	1.001	0.973	1.013	0.867	1.063	1.024	1.245
IRL	0.913	0.989	0.968	1.072	0.976	0.851	0.959	1.117
ITA	1.063	1.026	0.978	1.006	0.975	0.953	1.026	1.104
JPN	0.961	1.029	0.949	1.001	0.946	0.937	1.137	0.975
KOR	0.978	1.049	0.979	1.048	0.912	0.898	1.013	1.095
LTU	0.778	0.858	0.903	1.001	0.887	0.851	1.117	1.188
LUX	0.983	1.034	0.937	1.033	1.002	0.742	1.026	1.287
LVA	0.949	1.027	0.937	1.002	0.968	0.742	1.065	1.287
MEX	1.043	0.967	0.960	1.004	1.007	0.899	1.002	1.234
MLT	0.706	1.017	0.954	1.007	1.010	0.519	1.095	1.260
NLD	0.982	0.973	0.929	1.008	0.993	0.958	1.040	1.090
NOR	0.989	0.987	0.960	1.013	0.931	1.119	0.971	1.019
POL	1.103	0.999	0.975	1.010	0.948	1.033	1.134	1.010
PRT	0.896	0.989	0.967	1.003	0.962	0.818	1.102	1.077
ROU	0.755	0.897	0.970	1.016	0.961	0.867	0.982	1.045
RUS	0.941	0.950	0.973	1.075	0.928	0.864	1.018	1.160
SVK	1.122	0.969	0.869	1.001	0.952	0.870	1.310	1.226
SVN	1.010	1.008	0.897	1.004	0.986	0.783	1.290	1.118
SWE	0.943	1.015	0.965	1.010	1.004	0.906	1.042	1.006
TUR	0.871	0.979	0.908	1.011	0.939	0.978	1.007	1.048
TWN	1.141	0.997	0.949	1.039	0.908	0.987	1.115	1.163
USA	0.814	0.993	0.972	1.003	0.956	0.857	1.018	1.009

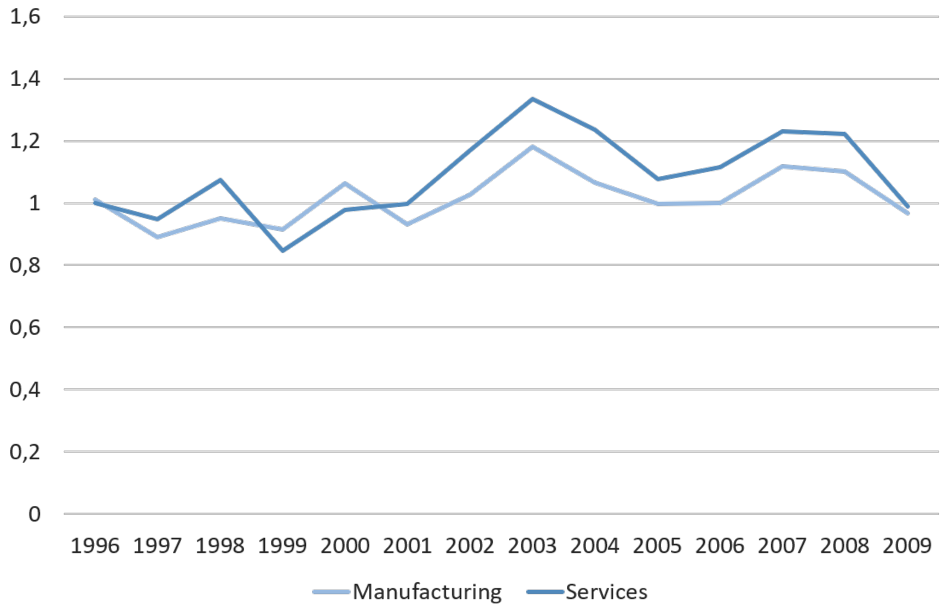
.0.15 Structural decomposition analysis of changes in the overall manufacturing employment, cumulative changes for 2008 - 2010, in %

	Man. employment growth index	Changes in the stucture of production	Changes in the use of domestic intermediates (offshoring/outsourcing)	Changes in the use of domestic intermediates (insourcing)	Changes in the manufacturing final demand structure	Changes in the share of man. expend. on total final demand	Changes in the final demand structure	Common growth of labour productivity and final demand volume
AUS	0.968	1.007	0.993	1.016	1.004	0.913	0.987	1.144
AUT	0.949	0.993	0.968	1.013	1.006	0.982	0.984	0.859
BEL	0.782	0.970	0.900	1.040	1.006	0.862	0.996	0.709
BGR	0.959	0.996	0.988	1.025	1.020	0.981	1.024	0.816
BRA	0.893	0.964	0.995	1.009	1.027	0.902	0.974	1.136
CAN	0.933	0.960	0.995	1.036	0.975	1.067	0.916	0.960
CYP	[]	[]	[]	[]	[]	[]	[]	
CZE	0.920	1.008	0.943	1.004	0.992	0.963	1.022	0.815
DEU	0.947	1.010	0.960	1.010	1.002	0.967	0.978	0.855
DNK	0.827	0.990	0.981	1.013	0.993	0.948	0.968	0.722
ESP	0.821	0.970	0.926	1.042	0.990	0.937	1.022	0.688
EST	0.845	1.010	0.981	1.007	0.974	1.025	1.071	0.679
FIN	0.880	1.016	0.940	1.032	1.013	0.982	0.920	0.751
FRA	0.816	0.962	0.958	1.026	1.012	0.875	0.975	0.736
GBR	0.698	0.944	0.929	1.037	0.979	0.804	1.007	0.594
GRC	0.979	1.014	0.982	1.042	0.988	1.044	0.998	0.809
HRV	0.930	1.010	0.994	1.017	1.006	0.982	1.010	0.748
HUN	0.918	0.988	0.955	1.017	0.976	0.974	1.024	0.753
CHE	1.000	1.005	0.988	1.026	1.003	0.953	0.983	1.032
CHN	0.979	1.019	0.995	1.027	0.974	1.007	0.957	1.259
IDN	1.031	1.032	0.993	1.029	1.061	0.931	0.965	1.365
IND	1.031	1.034	0.984	1.012	1.003	1.020	1.000	1.317
IRL	0.597	0.855	0.708	1.047	0.818	0.938	1.144	0.505
ITA	0.822	0.981	0.969	1.022	1.000	0.883	0.979	0.709
JPN	0.918	0.965	0.998	1.018	1.019	0.951	0.959	1.007
KOR	1.069	1.034	0.989	1.030	1.001	1.038	1.007	1.124
LTU	0.856	0.978	0.976	1.026	1.010	0.965	1.059	0.656
LUX	0.928	1.028	0.914	1.017	1.025	0.882	0.999	0.851
LVA	0.829	1.010	0.986	1.017	1.008	1.078	1.124	0.552
MEX	0.989	1.005	0.990	1.015	1.043	0.975	1.010	0.927
MLT	0.943	1.018	0.979	1.028	0.972	0.891	1.002	0.926
NLD	0.695	0.903	0.835	1.057	0.989	0.858	1.036	0.621
NOR	0.869	0.974	0.958	1.028	1.028	0.945	0.946	0.792
POL	0.861	1.000	0.985	1.021	0.988	0.880	1.036	0.745
PRT	0.897	0.986	0.987	1.018	1.006	0.962	0.984	0.800
ROU	0.930	0.950	0.961	1.006	0.974	1.060	1.029	0.759
RUS	1.040	1.042	0.992	1.014	1.019	0.997	1.004	0.932
SVK	0.876	1.006	0.967	1.015	0.977	0.975	0.974	0.797
SVN	0.871	1.010	0.982	1.015	0.982	0.966	0.976	0.732
SWE	0.852	0.965	0.966	1.035	1.001	0.940	0.959	0.777
TUR	1.006	1.008	0.991	1.024	1.009	0.988	0.978	0.974
TWN	1.060	0.990	0.986	1.019	1.006	1.006	1.011	1.123
USA	0.910	0.965	0.993	1.006	1.003	0.983	0.995	0.913

.0.16 Structural decomposition analysis of changes in the overall manufacturing employment, cumulative changes for 2011 - 2014, in %

	Man. employment growth index	Changes in the stucture of production	Changes in the use of domestic intermediates (offshoring/outsourcing)	Changes in the use of domestic intermediates (insourcing)	Changes in the manufacturing final demand structure	Changes in the share of man. expend. on total final demand	Changes in the final demand structure	Common growth of labour productivity and final demand volume
AUS	0.936	1.021	0.972	1.004	1.008	0.891	0.978	1.069
AUT	0.997	1.002	0.980	1.014	1.009	0.950	1.000	1.044
BEL	0.915	1.034	0.928	1.009	0.999	0.919	1.009	1.020
BGR	0.989	0.988	0.981	1.024	1.020	0.957	1.010	1.011
BRA	0.976	1.013	0.979	1.001	0.998	0.952	0.995	1.041
CAN	1.129	1.004	0.977	1.015	1.024	1.001	1.014	1.091
CYP	0.806	0.982	0.970	1.005	1.000	0.886	1.004	0.947
CZE	1.046	0.987	0.956	1.004	1.009	0.986	1.076	1.031
DEU	1.008	1.000	0.967	1.009	1.005	0.953	1.011	1.066
DNK	1.005	0.994	0.947	1.010	1.001	1.042	1.006	1.007
ESP	0.945	0.998	0.962	1.006	1.010	0.967	1.052	0.952
EST	0.997	1.004	0.978	1.007	1.008	0.999	0.983	1.020
FIN	0.947	1.014	0.977	1.024	1.019	0.929	0.989	0.998
FRA	0.962	1.013	0.970	1.008	1.009	0.933	1.016	1.015
GBR	0.977	1.020	0.987	1.061	1.026	0.964	0.940	0.984
GRC	0.966	0.987	0.989	1.035	0.981	1.052	1.012	0.914
HRV	0.908	0.978	0.979	1.003	0.992	0.949	1.044	0.962
HUN	1.009	0.996	0.960	1.021	1.011	0.995	1.016	1.011
CHE	0.992	1.021	0.983	1.014	0.981	0.944	1.013	1.040
CHN	0.978	1.046	0.998	1.034	1.001	0.989	0.966	0.947
IDN	1.329	0.992	0.982	1.006	1.022	1.009	0.969	1.357
IND	1.381	0.953	0.983	1.020	1.046	0.965	0.998	1.433
IRL	0.977	1.015	0.930	1.007	1.107	0.822	1.009	1.120
ITA	0.980	1.009	0.975	1.007	1.013	0.927	1.056	0.997
JPN	0.957	0.975	0.960	1.001	0.995	0.978	1.062	0.989
KOR	1.003	0.985	0.991	1.050	1.030	0.923	0.985	1.045
LTU	1.018	0.965	0.974	1.017	1.075	0.911	1.035	1.051
LUX	0.912	0.983	0.979	1.045	1.011	0.709	1.006	1.259
LVA	1.005	1.014	0.990	1.013	1.015	0.907	1.020	1.053
MEX	1.069	1.005	0.993	1.034	1.010	1.007	1.000	1.019
MLT	0.856	1.029	0.994	1.023	1.057	0.773	0.997	1.003
NLD	0.913	1.005	0.968	1.067	0.973	0.880	1.048	0.980
NOR	0.975	1.004	0.972	1.017	0.993	1.036	0.969	0.986
POL	1.029	0.956	0.989	1.008	1.016	0.994	1.039	1.030
PRT	1.015	0.992	0.982	1.007	1.009	1.007	1.064	0.957
ROU	0.994	1.003	0.986	1.020	0.975	0.981	1.017	1.014
RUS	0.881	0.989	0.973	1.004	1.023	0.912	1.001	0.976
SVK	0.946	0.973	0.957	1.047	0.992	0.927	1.063	0.994
SVN	0.985	0.989	0.982	1.017	1.022	0.945	1.063	0.971
SWE	0.948	1.024	0.980	1.011	1.006	0.903	0.978	1.052
TUR	1.336	0.990	0.981	1.006	1.022	0.946	1.048	1.350
TWN	1.016	0.968	0.983	1.020	0.990	0.975	1.001	1.084
USA	1.090	1.035	0.988	1.012	1.005	1.025	0.994	1.028

.0.17 Development of a price index in Slovakia, 1995 - 2009



Source: Author's calculations based on data from WIOD.org.

.0.18 Results of a deindustrialisation model, based on WIOD data in current prices, 1995 - 2014

VARIABLES	(1) Total_gen	(2) Total_gen	(3) Total_gen	(4) Total_gen	(5) Total_gen	(6) Total_gen	(7) Total_gen	(8) Total_gen	(9) Total_gen
lnpop	-0.110	-0.111	-0.113	-0.0945	-0.109	-0.114	-0.111	-0.0941	-0.0911
	(0.0880)	(0.0914)	(0.0922)	(0.0860)	(0.0855)	(0.0918)	(0.0896)	(0.0866)	(0.0833)
lnpop_sqr	0.00816	0.00828	0.00845	0.00693	0.00701	0.00789	0.00547	0.00694	0.00587
	(0.0125)	(0.0129)	(0.0129)	(0.0125)	(0.0125)	(0.0128)	(0.0126)	(0.0124)	(0.0124)
lny	0.272	0.283	0.289	0.269	0.274	0.276	0.284	0.266	0.275
	(0.235)	(0.246)	(0.246)	(0.232)	(0.230)	(0.239)	(0.235)	(0.232)	(0.229)
lny_sqr	-0.0146	-0.0151	-0.0155	-0.0143	-0.0147	-0.0148	-0.0152	-0.0141	-0.0146
	(0.0121)	(0.0127)	(0.0127)	(0.0120)	(0.0119)	(0.0124)	(0.0121)	(0.0120)	(0.0118)
man_del_At		-0.00612							0.0294
		(0.00601)							(0.0442)
man_del_DoDi	0.0644								0.0310
	(0.0477)								(0.0416)
man_del_Bmsm			-0.0138*			-0.00332	-0.0148*	0.0126	0.00374
			(0.00759)			(0.00993)	(0.00760)	(0.0207)	(0.0257)
man_del_sy				0.0671***				0.0732***	0.0646***
				(0.0163)				(0.0174)	(0.0170)
man_del_ecy					-0.0295				-0.0209
					(0.0177)				(0.0172)
developed x man_del_Bmsm						-0.0107			
						(0.00749)			
man_increase x man_del_Bmsm							0.0266***		
							(0.00696)		
Constant	-0.846	-0.840	-0.862	-0.878	-0.754	-0.784	-0.796	-0.882	-0.942
	(1.168)	(1.200)	(1.196)	(1.137)	(1.096)	(1.160)	(1.142)	(1.138)	(1.121)
Time FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Country FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	557	599	599	557	557	599	599	557	557
R-squared	0.549	0.552	0.554	0.559	0.556	0.556	0.571	0.559	0.567
Number of id	40	40	40	40	40	40	40	40	40

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

.0.19 Global direct manufacturing employment, in millions of people, share on total employment in %

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	14-00
G7	52.0	50.6	48.5	47.1	46.2	45.7	45.6	45.4	44.8	41.8	40.7	40.9	41.3	41.1	41.3	-10.7
China	110.4	107.5	104.0	103.9	110.6	120.0	128.1	137.6	145.3	149.4	148.2	172.6	177.6	174.8	168.3	57.9
Risers	66.4	68.3	69.7	71.9	73.2	74.1	72.6	72.3	72.0	70.8	74.3	79.2	97.6	105.6	116.0	49.6
Row	47.1	46.2	46.9	48.1	48.3	49.0	48.5	49.2	48.9	45.8	44.9	45.4	45.5	45.0	43.8	-3.3
Total man. emp.	275.8	272.6	269.1	270.9	278.4	288.8	294.9	304.4	311.0	307.8	308.1	338.1	362.0	366.6	369.3	93.5
World emp.	1932.9	1957.9	1982.4	2009.5	2042.9	2064.2	2082.7	2102.9	2116.4	2112.3	2120.9	2191.8	2292.9	2384.7	2462.3	529.4
Share on total emp.	14.3	13.9	13.6	13.5	13.6	14.0	14.2	14.5	14.7	14.6	14.5	15.4	15.8	15.4	15.0	0.7

Source: Author's calculations based on data from WIOD.org.

.0.20 Participation of G7 and other regions in the global final demand for manufacturing products, in millions of people

	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**14-00**
G7	5.6	5.5	5.5	5.7	6.1	6.3	6.7	7.4	7.8	6.5	7.2	7.7	7.4	7.4	7.4	1.8
Manufacturing	2.4	2.3	2.3	2.4	2.5	2.5	2.7	2.8	2.9	2.5	2.7	2.9	2.8	2.8	2.8	0.4
Services	2.8	2.7	2.8	2.9	3.2	3.3	3.5	3.9	4.1	3.3	3.7	4.0	3.9	3.9	3.9	1.1
Other	0.5	0.4	0.4	0.5	0.5	0.5	0.5	0.6	0.7	0.6	0.7	0.8	0.8	0.7	0.7	0.3
China	174.9	171.6	173.1	186.1	196.0	214.0	225.5	235.2	236.9	235.0	233.7	250.9	253.6	250.6	241.4	66.5
Risers	156.4	153.9	160.4	167.8	173.2	171.2	169.2	166.9	165.1	164.0	167.4	170.9	193.2	210.7	228.3	71.9
Row	61.1	59.8	60.0	61.4	62.8	64.0	63.9	64.0	63.9	59.1	59.9	60.1	59.2	57.8	56.3	-4.8
Total	398.0	390.8	399.0	421.0	438.2	455.4	465.3	473.5	473.7	464.5	468.1	489.6	513.5	526.5	533.4	135.4

Source: Authors' calculations based on data from WIOD.org.

.0.21 Integration of manufacturing in the final demand for services

	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**14-00**
G7	11,7	11,6	11,3	11,1	10,8	10,7	10,6	10,5	10,5	10,6	10,5	10,3	10,6	10,5	10,6	-1,1
China	21,5	20,0	17,8	17,3	17,8	20,6	21,2	21,9	22,9	23,6	23,4	27,2	28,4	29,0	28,5	7,0
Risers	9,0	9,4	9,8	9,9	10,0	10,2	10,3	10,3	10,2	10,4	10,6	11,2	13,9	15,6	17,2	8,2
Row	8,6	8,5	8,5	8,8	8,8	9,0	8,9	9,0	9,0	9,2	8,7	8,7	8,9	9,1	9,0	0,4
Total	50,8	49,5	47,4	47,0	47,5	50,5	50,8	51,6	52,6	53,8	53,3	57,6	61,8	64,2	65,2	14,4

Source: Author's calculations based on data from WIOD.org.