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# A Strike on the German Car Industry. A CGE Analysis of Trump's Recent Tariff Hike

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# A Strike on the German Car Industry: A CGE Analysis of Trump's Recent Tariff Hike

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**Abstract**

This paper explores the economic impact of the 25% U.S. tariff on new car imports, with a focus on Germany and the EU. Employing a Computable General Equilibrium (CGE) model built on the GTAP Version 11 framework, the study analyzes the effects on trade flows, sectoral dynamics, and factor markets in the USA, Germany, the EU, and the rest of the world. The simulation results suggest that unilateral trade measures, such as import tariffs on German automobiles, may ultimately be counterproductive. The U.S. fails to achieve substantial welfare or employment gains, as a significant portion of German car imports is used as intermediate inputs in U.S. car manufacturing. The findings underscore the considerable impact on Germany's automotive exports and the broader European trade landscape, highlighting the far-reaching consequences of protectionist policies on global trade, production, and employment.

**Keywords:** Computable General Equilibrium (CGE) model, GTAP model, trade policy

## 1. Introduction

The United States is the largest importer of cars from Germany, with approximately 3.4 million vehicles expected to be exported in 2025. This represents about 13% of all German car exports, followed by the UK (11.3%) and France (7.4%) (Statistical Bundesamt, 2025). On March 26, 2025, as part of the administration's protective trade policy, the Trump administration imposed a 25% tariff on all automobiles and automobile parts (White House Fact Sheet, 2025).

Import tariffs are taxes levied by a country on imported goods and services, with purposes such as protecting domestic industries, addressing trade deficits, and countering perceived unfair trade practices. The Trump administration's tariff escalations primarily targeted China, Canada, Mexico, and Europe, aiming to reduce trade deficits and encourage the return of manufacturing jobs to the U.S. By increasing the cost of imported goods, the administration sought to make domestic products more competitive, incentivize consumers to purchase local goods, and encourage foreign manufacturers to relocate production to the U.S.

The imposition of tariffs has long been a subject of debate, particularly regarding their effects on economies within trade blocs like the European Union (EU). Recent developments, such as tariff increases under President Trump, have renewed attention on this issue, especially with respect to Germany and the broader EU. Computable General Equilibrium (CGE) models provide a detailed understanding of the economic impacts of such tariffs, capturing the complex interdependencies between sectors, trade flows, and the broader economy. These models quantify the immediate impact of tariff shocks by simulating shifts in trade flows, production, employment, and household consumption. Tariffs raise the cost of imported vehicles, potentially leading to declines in foreign car sales in the U.S., disruptions in global supply chains, and retaliatory trade measures. Studies have shown that tariff-induced shocks can result in changes in sectoral output, factor prices, and overall economic welfare.

Empirical studies have questioned the effectiveness of these tariffs. For example, Autor, Dorn, and Hanson (2024) found that the 2018-2019 trade war did not provide economic benefits to the U.S. heartland; tariffs on foreign goods neither increased nor decreased U.S. employment in protected sectors, while retaliatory tariffs negatively affected employment, particularly in agriculture. Similarly, Chow and Sheldon (2021) reported that U.S. consumers bore the cost of tariffs, leading to increased prices and a net economic loss. These findings suggest that while tariffs can generate government revenue, they often result in higher consumer prices, effectively transferring income from consumers to the government and distorting economic activity.

Retaliatory measures by affected countries can exacerbate these economic challenges. Research by Fetzer and Schwarz (2020) shows that retaliatory tariffs were strategically aimed at regions that supported President Trump in the 2016 election, leading to adverse employment effects in those areas. This highlights the complex economic and political ramifications of tariff impositions.
For instance, Li (2020) employed a CGE model to analyze the impact of U.S. automotive import tariffs on NAFTA countries and the European Union. The study found that while European manufacturers experienced only minor effects, NAFTA countries faced higher production costs, wage reductions, and price distortions (Li, 2020). Similarly, Riker (2019) used a multi-sector CGE approach to estimate the consequences of auto tariffs, concluding that higher tariffs would result in job losses and a decline in U.S. GDP (Riker, 2019).

A broader CGE assessment by Freund et al. (2019) at the International Monetary Fund (IMF) examined the global effects of U.S. auto tariffs. Their findings suggested that protectionist measures could generate negative global economic spillovers, reinforcing the argument that trade liberalization typically leads to better economic outcomes than restrictive policies (Freund et al., 2019). Additionally, Abrego et al. (2020) explored trade policy uncertainty and the role of CGE modeling in measuring its effects on production and investment, showing how firms in the automotive sector adjusted their supply chains in response to tariff impositions (Abrego et al., 2020).

In summary, while the Trump administration's tariffs aimed to bolster domestic industries and reduce trade deficits, studies suggest that they may have led to increased consumer costs and unintended economic consequences. These outcomes highlight the need for careful consideration of both the immediate and long-term impacts of trade policies. In this study, we use Computable General Equilibrium (CGE) modeling to simulate the recent import tariff shock on car and car parts imports, specifically focusing on Germany, the U.S., Europe, and the rest of the world. Our analysis is based on the recently published Global Trade Analysis Project (GTAP) database version 11, utilizing the GTAP model V.7.

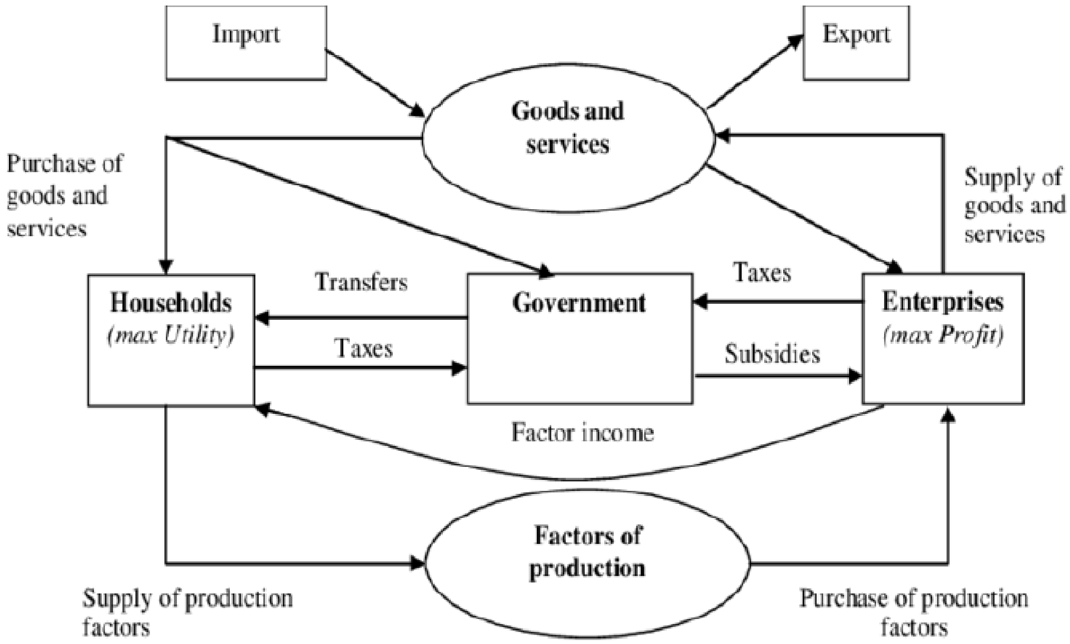
## 2. CGE Model Setup and Database Aggregation

We aim to understand the economic wide impact of the recenet 25% new cars import tariff on the german economy and the EU economy. The analysis employs a Computable General Equilibrium (CGE) model using the recenet GTAP database 11 (Agujar, et al. 2022) with base year 2017 of 4x6x5: 4 regions (USA, Germany, EU and rest of the world), 6 sectors (Agricuture, extraction, light manufacturing, heavy manufacturing, cars and parts, other sevices) 5 factors of production (land, skilled labor, unskilled labor, capital and natural resources).

This structure is illustrated in Figure 1, which presents a circular flow diagram outlining key interactions in a simplified economy. Households (consumers) purchase goods and services from domestic producers and import finished goods from abroad. Meanwhile, enterprises (producers) compensate consumers for their contributions to production through wages and capital rents. Producers also engage in economic exchanges by purchasing intermediate inputs from one another, importing intermediate goods, and exporting both final and intermediate products.

Additionally, the government plays a role by providing subsidies and transfers to consumers while levying taxes on both households and businesses. The analysis of U.S.-imposed automotive tariffs will focus on transactions between four key economic agents: consumers, producers, the government, and foreign firms.

**Figure 1: Circular Flow Diagram of Interactions in an Economy**




Reference: Li, (2018)

The GTAP model in our analysis is static and operates under the assumptions of perfect competition and constant returns to scale, while also incorporating Armington's assumption, which distinguishes commodities based on their country of origin and treats imports from different sources as imperfect substitutes. With 141 countries and 65 categories of goods included in the Version 11 database (2017), GTAP is particularly useful for assessing the diverse impacts on various sectors, regions, and factors of production, such as labor, capital, and land. As noted by Mensbrugghe (2015), the model tracks bilateral trade flows between any two regions across all sectors and captures international capital flows, which adjust in response to relative changes in expected rates of return on capital.

**Table 1: Imports from Germany and Europe to USA (million of dollars)**

| **Categroy** | **Europe** | **Germany** |
|---|---|---|
| Cars and cars parts imports | 30.067 | 29.913 |
| Agriculture | 27.084 | 2.205 |
| Extraction | 2.877 | 39 |
| Heavy manufacuring | 199.199 | 71.498 |
| Light manufacturing | 82.151 | 15.933 |
| Other services | 187.018 | 33.357 |

*Europe include the following countries Austria Belgium Bulgaria Croatia Cyprus Czechia Denmark Estonia Finland France Greece Hungary Ireland Italy Latvia Lithuania Luxembourg Malta Netherlands Poland Portugal Romania Slovakia Slovenia Spain Sweden United Kingdom of Great Britai Switzerland Norway Iceland Liechtenstein

Data from the GTAP Database 11 (Table 1) reveal Germany's dominant role in U.S. imports, especially in the automotive sector. Germany alone accounts for $29,913 million of car exports to the U.S., while the rest of Europe contributes $30,067 million, nearly matching Germany's export value. In heavy manufacturing, Germany exports $71,498 million, accounting for over a third of Europe's total export value of $199,199 million. In contrast, Germany's agricultural exports are modest at

$2,205 million, compared to Europe’s $27,084 million, and the extraction sector sees a minimal German contribution of $39 million, relative to Europe’s $2,877 million.

Germany also plays a significant role in light manufacturing ($15,933 million) but is outpaced by the broader European exports in this category ($82,151 million). Similarly, Germany’s service exports are $33,357 million, much smaller than Europe’s $187,018 million, indicating that other European countries are more involved in transatlantic service trade. The data emphasize Germany’s strength in industrial exports, particularly in manufacturing, while highlighting other European countries’ contributions in agriculture, services, and raw materials.

According to the latest factsheet from the Statistisches Bundesamt (2025), motor vehicles and parts accounted for 16.9% of Germany's exports in 2024, making it the country’s top export product, followed by machinery (14.0%) and chemical products (9.0%). The main destinations for German car exports are the USA, China, the UK, France, and Italy.

**Figure 2: German cars exports by country 2025**

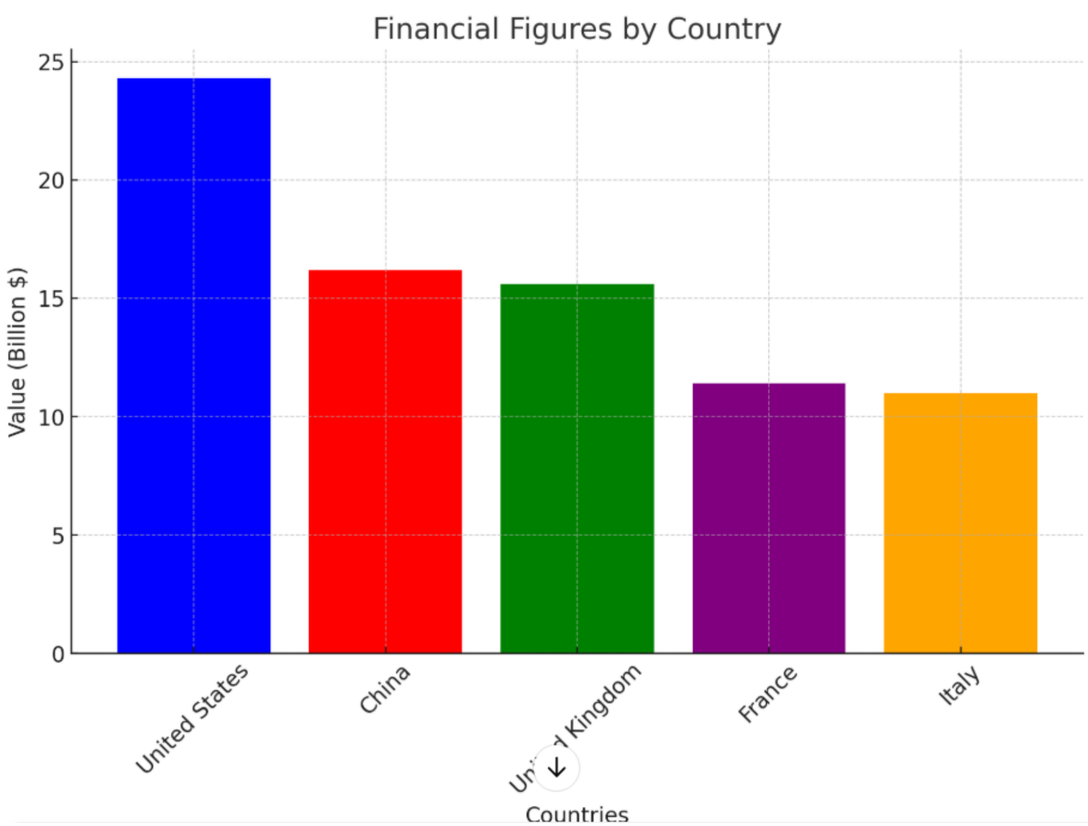



Table 2 reveals a non-uniform structure of import taxation in the U.S., with tax rates varying by sector and by the final use of goods—government consumption, private household consumption, or investment inputs. Notably, government consumption faces 0% import taxes across all categories, indicating a deliberate policy of tax neutrality for public procurement. For private households, tax rates are generally positive, especially for heavy manufacturing (8.45%) and services (2.82%), while light manufacturing and agriculture show slightly negative rates (-0.21% and -0.17%, respectively), suggesting these are effectively subsidized when consumed by households—possibly due to tariff exemptions or price support mechanisms. Cars (1.24%) and extraction products (1%) also face low but positive rates, reflecting mild protection or standard tariffs.

In the case of investment-related imports, the pattern is more varied. Heavy manufacturing (4.31%) and light manufacturing (5.40%) inputs are taxed, potentially raising the cost of capital investment. However, extraction (-13.37%) and services (-11.4%) face substantial negative rates, indicating strong subsidies for these inputs—possibly to lower energy and service input costs for industries. Cars (1.34%) face modest taxes, while agriculture (0%) remains neutral.

**Table 2: Tax rates on Imports in USA**

| **Categroy** | **Cars** | **Agriculture** | **Extraction** | **Heavy Manufacturing** | **Light manufacturing** | **Other services** |
|---|---|---|---|---|---|---|
| Governmnet consumption | 0% | 0% | 0% | 0% | 0% | 0% |
| Private HH conumsption | 1.24% | -0.17% | 1% | 8.45% | -0.21% | 2.82% |
| Investment-Inputs | 1.34% | 0% | -13.37% | 4.31% | 5.40% | -11.4% |

- Negative rates are subsided imports

Overall, the data suggest a policy mix where government purchases are tax-exempt, household consumption is selectively taxed or subsidized, and investment inputs are strategically subsidized, especially in sectors critical to industrial or energy use. This structure likely reflects a balance between encouraging domestic investment, managing consumer costs, and selectively protecting certain industries.

**Table 3: Disposition of imported cars by use-USA (Million of dollars)**

| **Categroy** | **Value** |
|---|---|
| Production | 106.532 |
| Consumption | 102.786 |
| Governmnet | 148 |

Table 3 shows that most imported cars in the U.S. are allocated to production ($106,532 million), indicating their significant role in U.S. vehicle manufacturing. A substantial portion is also consumed by households ($102,786 million), with government purchases being negligible ($148 million). This distribution highlights the dual role of imported cars in supporting both industrial activity and consumer demand in the U.S.

## 3. Simulation reslts and discussion

After running simulations with a 25% tariff on car imports, we solved the model using the Gragg 2-4-6 method to optimize the solution given the magnitude of the tariff shock. The analysis focuses on four primary economic variables to provide an overview of the economic impacts across three regions: the USA, Germany, the EU, and the rest of the world. We allow for endogenous labor and capital endowments, incorporating wage stickiness in the market.

**Table 4: Post shock impac on selected macroeconomic variables**

| Regions | Nominal GDP | | | | Cars output/production | Regional income |
|---|---|---|---|---|---|---|
| | % | Pre shock | Post shock | Nominal loss/gain (millions USD) | | |
| Germany | -1.07% | 3690815 | 3651191 | -39624 | -5.84% | -1.07% |
| USA | -0.03% | 19479582 | 19473716 | -5866 | 0.83% | -0.01% |
| EU | -0.24% | 14954968 | 14918834 | -36134 | -0.44% | -0.24% |
| Rest of World | 0.07% | 43268716 | 43299984 | 31268 | 0.86% | 0.07% |

The CGE simulation shows that Germany experiences the largest economic setback, with a 1.07% drop in nominal GDP, a sharp 5.84% contraction in car output, and a $39.6 billion reduction in income. This aligns with empirical findings that economies highly dependent on a specific export sector—such as Germany's automotive industry—are disproportionately affected by trade shocks (Felbermayr et al., 2013; Dauth et al., 2014).

The EU also suffers a GDP loss (-0.24%) and $36 billion in income decline, reflecting the supply chain interlinkages within the European automotive cluster (Baldwin & Lopez-Gonzalez, 2015). For the United States, the macro impact appears limited, with only a 0.03% GDP decline and $5.87 billion in income losses. However, U.S. car output rises slightly (0.83%), indicating some import substitution, a common short-run effect of import tariffs (Irwin, 1996).

In contrast, the rest of the world (RoW) sees marginal gains (+0.07% GDP, $31.2 billion in income), which supports the theory of trade diversion in response to preferential or punitive trade measures (Viner, 1950; Francois & Wignaraja, 2008). This shows that non-German producers are likely to replace German cars in the U.S. market.

**Table 5: Post shock impact on factors of poduction**

| Regions | Skilled labor | Unskilled labor | Capital |
|---|---|---|---|
| Germany | -1.06% | -1.07% | -1.09% |
| USA | -0.02% | -0.02% | -0.02% |
| EU | -0.25% | -0.24% | -0.24% |
| Rest of World | 0.07% | 0.07% | 0.07% |

The negative impact in Germany is spread uniformly across all factors of production: skilled (-1.06%), unskilled labor (-1.07%), and capital (-1.09%) - approximately **900,000** job losses in Germany from a 2% increase in unemployment, reflecting a systemic contraction in activity—consistent with findings from Bown and Tovar (2011), who document how targeted tariffs induce resource reallocation and inefficiency in the targeted economy.

The U.S. shows negligible factor market effects (all around -0.02%), suggesting that tariffs failed to generate notable employment or investment gains, an outcome supported by Autor et al. (2016), who argue that protectionist policies may not translate into substantial job creation due to automation or pre-existing capacity.

EU-wide and RoW effects mirror their macro trends: EU sees moderate negative impacts (-0.24%), while RoW benefits across all factor categories (+0.07%).

**Table 6: Welfare decomposition**

| Regions / Efficiences | Allocative | Endwment | Technology | Population | Terms of trade | Inv. / Saving | Preferences | Total |
|---|---|---|---|---|---|---|---|---|
| RestofWorld | 6915 | 20845 | 0 | 0 | -188 | -182.559 | 0 | 27390 |
| USA | -3202 | -2315 | 0 | 0 | 342 | 226.5215 | 0 | -4948 |
| Europe | -14070 | -18272 | 0 | 0 | -109 | -36.5746 | 0 | -32488 |
| Germany | -15438 | -20010 | 0 | 0 | -44.61 | -7.4042 | 0 | -35501 |
| Total | -25795 | -19752 | 0 | 0 | -0.02 | -0.0166 | 0 | -45547 |

The welfare analysis offers deeper insight into the costs of this policy[1]. The U.S. loses $4.95 billion in net welfare, mainly due to allocation (-3.2B) and endowment effects (-2.3B). While there are modest gains from terms of trade (TOT) and investment-saving (IS), these are insufficient to offset the losses—highlighting the inefficiency of unilateral trade interventions (Krugman, 1987; Caliendo & Parro, 2015). Germany incurs a staggering $35.5 billion welfare loss, largely from similar mechanisms, showing how exposed it is to U.S. market access in this sector. The broader Western European bloc loses $32.5 billion, reinforcing the spillover effects through EU-wide supply chains (Gasiorek & Holmes, 2010).

By contrast, the rest of the world gains $27.4 billion in welfare, largely through improved allocative efficiency and terms-of-trade improvements, consistent with the idea that third-party countries benefit from trade redirection (Anderson & van Wincoop, 2003).

## 4. Conclusion

This simulation confirms that unilateral trade measures such as import tariffs on German automobiles may backfire. The U.S. fails to achieve significant welfare or employment gains because a marginal size of the german car imports are used as intermediate inputs for USA cars manufacturing. The broader global economy adjusts through resource reallocation, mostly benefitting third countries.

These results align with a broader body of literature on the ineffectiveness of protectionism in globally integrated value chains. Studies by Grossman and Helpman (1994) and Freund and Ornelas (2010) stress that tariffs often reduce aggregate welfare, generate inefficient distortions, and create retaliatory risks—all of which are seen in the European and German losses here.

Overall, the findings highlight that CGE models remain a vital tool for understanding general equilibrium effects of trade policy and are especially important in assessing second-round effects beyond bilateral relationships, as recommended by Hertel (1997) and van der Mensbrugghe (2005). This study assesses the economic impact of the recent 25% U.S. tariff on automotive imports, focusing on the effects on Germany and the EU, using the GTAP-based Computable General Equilibrium (CGE) model. The findings underscore the significant role that the automotive sector plays in

[1] The GTAP welfare decomposition utility disaggregates the total welfare effect into seven components: resource allocation (efficiency) effects, also called the excess burden of taxes; endowment effects due to changes in factor supplies; technical change due to productivity gains or losses; the effects of population growth; changes in terms of trade for commodities; changes in terms of trade for savings and investment goods; and changes in preferences due to changes in the structure of aggregate demand among household consumption, savings, and government. Welfare effects are reported in levels, in $US millions.

Germany's export economy, with the imposition of the tariff having a substantial impact on both the German and broader European economies. The model results suggest that while the tariff is designed to protect domestic U.S. industries, it creates considerable disruptions in global trade flows, particularly in sectors like heavy manufacturing and automobiles, which are crucial to Germany's export performance.

The analysis reveals that Germany, as a major exporter of cars to the U.S., faces direct losses in market access, while the EU also experiences economic adjustments due to its interconnectedness with Germany. Moreover, the model highlights the broader economic consequences of such tariffs, including changes in production, trade flows, and factor prices, with potential implications for employment and consumer prices.

The results further emphasize the complexity of protectionist trade policies, showing that while tariffs may shield domestic industries in the short term, they often lead to unintended economic distortions. These include retaliatory trade measures, higher consumer prices, and disruptions in global supply chains, which can offset any gains from tariff protection. The study contributes to the ongoing debate on the efficacy of trade protectionism, providing a deeper understanding of its economic ripple effects across different regions and sectors.

Overall, this paper highlights the need for policymakers to carefully evaluate the long-term consequences of trade policies, considering both their direct and indirect impacts on domestic industries, international trade relations, and broader economic welfare whil considering also the reaction of target countries by imposing similar tariff and become engaged in a form of “economic war”. Further research is needed to explore the full scope of these impacts, including the potential for retaliatory measures and the long-term effects on global trade liberalization.

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