Structural Change in Productivity of German Economy from Unification till Euro-Crisis. An Input-Output Analysis

Alexandros GYMNOPOULOS[a], Athanasios POULAKIS[b], Charalampos POULAKIS[c], Nikolaos CHATZARAKIS[d]
Aristotle University of Thessaloniki, Greece

Abstract

Germany is considered by many as the leading economy in the European Union (EU), the economy that not only presents a relatively large growth rate, but also serves as a leading figure for the European countries. The positive intertemporal trade balance it has, is yet another interesting element for economic research ; it is the main proof as for the status Germany has among the countries of EU, but also the major case in favour of those theories posing Germany as the developed metropolis over an under-developed European-South periphery. The present work focuses on the structural change presented in the production of the German economy from its unification at 1989/1990 until the present crisis in the EU as a form of understanding the trade relationships Germany has established and how have they changed through the years. The study of those structural changes will be based on the temporal evolution of the technical coefficients of the German economy, taken from input-output tables from 1990. The same research will also be conducted for France, since it can be considered the second leading European economy, and consequently it will appear as a sufficient comparison to Germany. The study will be accompanied by a presentation of the historical and geopolitical status of Germany.

Keywords: Germany, France, International Relations, Trade, Technological Change, Input-Ouptut Analysis
JEL Nr.: F5, O4, Y1

Introduction: Germany in Space and Time

The Origins of Convergence

Since World War II has finished, the war scenery in the western part of the Elder Continent, being the Liberal and Capitalist Europe, supported the creation of Pan-European institutions. This intention was denatured into a political goal by

Corresponding addresses:
[a] Alexandros GYMNOPOULOS, Aristotle University of Thessaloniki, Department of Economics, Greece. **Email:** gymnalex@econ.auth.gr
[b] Athanasios POULAKIS, Aristotle University of Thessaloniki, Department of Economics, Greece. **Email:** poulakia@econ.auth.gr
[c] Charalampos POULAKIS, Aristotle University of Thessaloniki, Department of Political Sciences, Greece. **Email:** hpoulakis@hotmail.com
[d] Nikolaos CHATZARAKIS, Aristotle University of Thessaloniki, Department of Economics, Greece. **Email:** chatzarn@econ.auth.gr

W. Churchill, when, in 1964 in the University of Zurich[1], he proposed the creation of the "United States of Europe", that would be governed by the principles of common security, peace and freedom.

Despite these, idealism was not the only factor combining the European states into this new form of political organization. The desire to preserve freedom, ensuring the social and economic development of the western part of the Continent was the driving force of this attempt (Heywood, 2007). The long-lived and constantly revived French-German conflict that troubled the European states system ever since the Prussian wars[2] of 1871, should now become part of history. Let us not forget that French-German (and not only) imperialist struggles led to the First World War. Following this policy of integrating Germany into a united Europe, the "German problem" would be solved once and for all. Furthermore the vital necessity of reconstructing the destroyed-from-the-war Germany, through a united economic space based on free trade principles, had become apparent. The economic protectionism of the mid-wars was considered to be the source of many evils. Eventually, France and Western Germany were the main protagonists in this new European road.

Beyond these clutch internal factors, external factors were also of great importance for this new attempt. By all powers they had, the U.S.A. were seeking the creation of an economically prosperous, politically and militarily homogeneous Western Europe, to use it both as a market for their exports and as a counterweight for the Soviet expansionism; Western Germany was from the start destined to be the outpost in this new bipolar world order (Heywood, 2007). Consequently, and in spite of the federalist ideologists, the European plan was concentrated on the economic part[3]. In 1952, following the initiative of the French Minister for Foreign, R. Schuman, the European Coal and Steel Community was formed with the participations of Belgium, France, Italy, Luxemburg, Netherlands and –of course– Western Germany. The attempt was considered successful and was followed in 1957 by the Treaty of Rome, by which the European Economic Community was officially born. In 1962, the EEC and the ECSC were merged into the European Community, with the latter expanding in 1973 with the accession of the United Kingdom, Ireland and Denmark. The "third wave of democratization", as Samuel P. Huntington named it, allowed Greece in 1981, and Spain and Portugal in 1986 to enter the EC. In the way, in 1978-1979, a great step was made by the adoption of the European Monetary Unit.

Social Market Economy

The Social Market Economy or Social Capitalism is a specific form of capitalism that was mostly developed in the largest part of the Western and Central Europe (Kennedy, 1987); its homeland is considered to be Germany, but variations of it are found in many European countries. One could claim it to be the landmark economic system of Western and Central Europe.

---

[1] Sir Winston Churchill speaking in Zurich I9th September 1946

[2] That led to the formation of the German state.

[3] This neo-functionalist approach theorized that the benefits of the economic partnership would be "diffused" –the so-called *spill-over-effect*–and will eventually lead to economic integration.

This form of economic organization was influenced by the realist ideas of political economist like F. List (1789-1846), more than the usual principles of free market as they were expressed by the classical thinkers. List was a defender of economic power of politics and political power; he believed in state intervention intended to protect the domestic Infant industry from foreign competition (Heywood, 2007). The central motive of this model is the free market, mixed with elements of solidarity and social coherence.

Especially in Germany this system is based on the interconnection of the industrial and the finance capital, that takes the form of a close relationship between business groups and banks that are usually shareholders of the former. It is essentially one of the pillars that oriented the post-war German economy towards long-term investment and against short-term profits. This was made possible because the Bretton Woods system and the GATT gave the ability to all developed countries to chart their own form of capitalism. Furthermore, the organization of the corporations in Germany was based on social partnership. The trade unions are represented by the factory councils and they participate to annual negotiations for the level of wages, concerning all the industries. At the same time high-level public services and wide and state-financed welfare amenities have ensured a decent standard of living for the workers, the low and middle social classes (Heywood, 2007). In this way, a model of a "participating capitalism" was created, that takes into account the interests of the workers and the whole society (Hutton, 1995). After the war, the idea of a social market was promoted by economists like A.M. Armack; the free market seemed to be not a goal in itself, but a means to achieve further social goals.

In this direction, the influence of Socialdemocracy was rather important, trying to achieve a mutual understanding and compliance between the several social classes and groups. On the one hand, capitalism was considered to be the only credible system of production, but the wealth derived from it should be shared according to the principles of social justice. In its conference at Bad Godesberg in 1959, the SPD adopted the slogan "as much of market as possible, as much of planning as necessary". Following the teachings of Keynesianism and integrating the state intervention in its policies, the German Social democracy moved towards a fair distribution of incomes, full employment, regular capital reproduction and planning the economic development. But the Social democrats were not the only ones who adopted this strategy; the Christian democrats also followed the "Sosial Democratic Compliance", despite their initial objections. With L. Erhard being the main example, the CDU also embraced the social market economy. Eventually, the strategy of the social market economy has turned into the prime state policy with the compliance of both leading parties –the SPD and the CDU– despite core differences.

The advantages of the Social Market Economy were shown in the economic miracle that transformed the destroyed Western Germany into the first European economic power ever since the 1960's. The high and stable levels of capital formation combined with the high levels of educations, focusing on professional and technical skills, allowed Germany to reach the highest levels of productivity in Europe. The sufficiently high levels of effective demand have fortified the system against underconsumption crises. Among the disadvantages, we can account the inflexibility

occurring from the statutory "triangular" negotiations between employers and employees, under the supervision of the state, and the necessity of higher taxation for the maintenance of the welfare state (Heywood, 2007). These two elements are contributing to a possible downturn of competitiveness of the country and the weakening of its productive structure –unless there is sufficient counterbalance.

Germany: From Ashes to Rebirth

Europe rose destroyed out of the ashes of the Second World War. The damages it suffered on both its infrastructure and human lives were incomparably greater than those of the First World War. The destruction of the main productive structure of Germany reached the value of 20% (Heywood, 2007). However, the Bretton Woods system and the institutions formed around it, created extremely fruitful conditions for the German post-war economic miracle; the adoption of social market economy was the other main contributor. As a result, during the period 1950-1962 the growth of the national income reaches an annual percentage of 7,3% in Western Germany. One of the first challenges the German economy faced was the rising inflation, that was confronted by state intervention at 1948. Due to its very important geopolitical position, Germany absorbed a great part of the 24 billion dollars that arrived at Europe as a direct help, as well as a part of the U.S. Marshall Plan (Berstein and Milza, 1997).

Following the "containment" dogma, as well as the "opening" of the German market under the leadership of the U.S.A., the huge post-war debt of Germany was erased in the Conference of London in 1953. Relieved from these obligations, and having a high level of social assent, a strong current and a compact banking system, Western Germany managed to escape the economic disaster. Another important fact is the complete lack of colonies and subsequently of colonial obligations –which were proved crucial for other large developed economies, like France or Great Britain, at that time. From 1949 to 1958, the GNP of Western Germany was tripled, its reserves reached 6 billion dollars, while the full employment after the EEC was formed, was considered ensured since the unemployed did not exceed the 3% of the economically active population. By 1960, the Federal Republic of Germany had the 10% of global exports (Berstein and Milza, 1997). As a result of the "Socialdemocratic Assent", the German governments, as most of the European governments, expanded the institution of the welfare state. This is the most important innovation of the post-war world; the state is responsible for stabilizing the economy, securing sufficient growth rates, safeguarding the trade balance and fighting unemployment and inflation. Besides the social amenities and the high public expenditure for investment and consumption, the public debt remained in low levels. Besides the material wealth of society and the raised expectations, the social unrest of 1968 doubted the social structure; the upraised students drift along them great parts of the working class, and the uprisings shock both France and afterwards Western Germany. Especially in Western Germany, from 1966, we have numerous autonomous groups that eventually constitute the "Extra-Parliamentary Opposition" (APO) (Hobsbawm, 2010).

Since 1966 the external policy of the Federal Republic of Germany is differentiated from the typical European one. The government of Bonn abandons the "Hallstein Doctrine" and chancellor Ludwig Erhard proposes a non-attack pact. While it was not successful at first, three years later both sides –the U.S.A and the E.U. on the one hand, and the U.S.S.R and Eastern Germany on the other– agree to an approximation. However, the crucial role for this approximation is played by the Eastern Policy (Ostpolitik) by the Social democrat chancellor Willy Brandt. In August of 1970, and despite the objections of the German Christian democrats, he signs a pact with the Soviet Union, and in December of the same year with Poland. The next year, the two Germanies sign a "fundamental treaty" with which they recognize each other as equal states with sovereign rights. They also agree to solve all of their problems by use of peaceful means, to respect their borders and their territorial integrity (Berstein and Milza, 1997). In 1972, the Federal Republic of Germany, signed another pact, this time with Czechoslovakia.

This policy was necessary in order for Western Germany to overcome the status of "political dwarf". It managed to disengage itself from the conflicts at the eastern borders and to delight in a political and economic prosperity. The conditions were very beneficial to the German economy allowing new profitable activities like trade (Berstein and Miliza, 1997). Several conservative political powers attacked Brandt for compliance, but history justified him after the "reunification of Germanies".

The Bretton Woods system collapsed in 1971 and the oil crisis burst out in 1973; serious troubles stroke the world economy. Although Western Germany was also hit from these shocks, it managed to hold its unemployment and inflation in the bearable levels of 3,6% and 5% respectively. It was then that the phenomenon of stagflation appeared in Western Europe and became the excuse for the monetarist counterattack. Western Germany also applied monetarist policies of fiscal and currency austerity under the leadership of Helmut Schmidt and Helmut Kohl during the period 1976-1981 (Hobsbawm, 2010).

In 1975 the international stage was unstable with the Soviet Union establishing the SS-20 missiles at Eastern Europe; the United States tried to respond with an anti-missile zone of Persing-2 missiles. Western Germany, due to its position, was located at the heart of these events and was shocked from the inside by a strong pro-peace movement. At the same period, it faced internal terrorist attacks as another impact of the generalized political situation. Eventually, the international tension was relieved when M. Gorbachev took over the leadership of the U.S.S.R in 1985. Yet the economic instability of the Soviet Union led to political instability in the whole Eastern Bloc. The first victim was the People's Republic of Germany; at March of 1989 the Soviet president informed the Eastern German authorities that the U.S.S.R. can support them no longer, nor interfere to maintain the social and political *status quo*, resulting to the fall of the Berlin Wall later that year and the electoral collapse of the government at the next. Technically, the People's Republic of Germany no longer existed. In July of 1990 its economic and monetary union with the Federal Republic of Germany is announced and at October of the same year the two Germanies are back into one (Hobsbawm, 2010).

Data and Methodology

If we wish to study the inter-sector relations of an economy, we can make use of the Input-Output Tables of this economy; the latter ones depict the flows of commodities or money from the one industry to the other. The main structure of the tables is based on the following system of equations

$$X_i = \sum_j X_{ij} + Y_i$$

, where X_i is the total output of sector i, X_{ij} is the portion of total output of sector j used as input to sector i, what we may call the intermediate consumptions, and Y_i is the final demand for the commodity of this sector, combining the domestic use of these products by households, government and companies, as well as the exports. One of the main assumptions in order for this system to be valid is that each industry is producing one and only one commodity, so the number of industries is equal to the number of commodities.

We define the technical coefficients as the ratio of the input from sector j over the total output of that sector

$$a_{ij} = \frac{X_{ij}}{X_j} \quad (1)$$

The former equations can now be reformulated as

$$X_i = \sum_j a_{ij} X_j + Y_i \quad (2)$$

Here, we can see the straight relationship between the outputs of all industries as combined in order to produce the output of one of them; in other words, we can see the contribution of each sector to the production in one of them. The technical coefficients are the quantities (or the amounts of money, in case of nominal terms) needed from all sectors so that one unit of product (or one monetary unit, in case of nominal terms) of this sector will be produced under the existing technology and the given conditions of production. In matrix form, this relationship can be also written as

$$x = A\,x + y \quad (3)$$

, where x is the total output vector, y the final demand vector and A is the matrix of the technical coefficients (Miller and Blair, 2009).

It is an obvious fact though that one country can purchase commodities both from its domestic economy, as well as from abroad; consequently, the industries can purchase their intermediate consumptions both from inside and outside the country. So the technical coefficients we have presented here are actually the combination of two technical coefficients, the first obtained in respect to the domestic intermediate consumption, the second from the inputs imported from other countries. Again, we will write our equation in a new form

$$x = (A^d + A^m)\,x + y \quad (3')$$

, where A^d is the matrix of the domestic technical coefficients and A^m the matrix of imported technical coefficients. But, we can also express this relationship in another way.

If A is indicating the technology used for the production, that is the proportions of the sectors contribution to the production of these sectors, and A^d the domestic inputs of the sectors, then we can follow Franke and Kalmbach (2005) into defining a domestic absorption index as the ratio of each domestic coefficient over the respective technical coefficient

$$h_{ij} = \frac{{a_{ij}}^d}{a_{ij}} \quad (4)$$

, where ${a_{ij}}^d$ is the domestic coefficient. This index indicates the percentage of the domestic commodities used as intermediate consumptions to produce other commodities; it can be linked to the import penetration of foreign commodities meant for production, since it decreases as the latter rises. The values it can take span from 0, when ${a_{ij}}^d = 0$ and no domestic product is used, to 1, when ${a_{ij}}^d = a_{ij}$ and no imported product is used.

Now, we can write equation (3) as follows

$$x = (A \circ H)x + y \quad (3'')$$

, where H the matrix of the domestic absorption indices, and $A \circ H$ indicates a simple multiplication of each element of matrix A with the corresponding element of matrix H. This can be solved in respect to the output vector as

$$x = (I - A^d)^{-1}y = (I - A \circ H)^{-1}y \quad (4)$$

, where $(I - A)^{-1}$ the Leontief inverse concerning the domestic inputs; this matrix is nothing more but a matrix of *ex post* multipliers for all economic activities of an economy (Miller and Blair, 2009). Here, the final demand can be decomposed to its initial elements: the domestic demand for consumption of households, y^{DHC}, the domestic demand for government spending, y^{DG}, the demand for investment, y^{DI}, the demand for exports, y^{Ex}, and the demand for imports, y^{Im}. As a result, the equation (4) can be written further

$$x = (I - A^d)^{-1}y = (I - A \circ H)^{-1}(y^{DHC} + y^{DG} + y^{DI} + y^{Ex} - y^{Im}) \quad (4')$$

Again following Franke and Kalmbach (2005), we will take the temporal differences of equation (4'), and we will attempt to acquire a decomposition of the growth rate –of the total economy, or a specific economic sector– to its main components. The relationship we will reach will have eight terms, one for the differences in technology, as measured by the matrix A, one for the differences in domestic absorption, as measured by the matrix H, one for each component of final demand, plus a residual term, that will show us the differences between our computed growth rate and the actual one.

Concerning the complete economy of one country, the growth rate is decomposed as follows

$$\frac{s^T \Delta x}{s^T x_o} = \frac{s^T \left(I - A_o^d\right)^{-1} (\Delta A \circ H)\, x_o}{s^T x_o} + \frac{s^T \left(I - A_o^d\right)^{-1} (A \circ \Delta H)\, x_o}{s^T x_o} + \frac{s^T \left(I - A_o^d\right)^{-1} \Delta y^{DHC}}{s^T x_o} + \frac{s^T \left(I - A_o^d\right)^{-1} \Delta y^{DG}}{s^T x_o} + \frac{s^T \left(I - A_o^d\right)^{-1} \Delta y^{DI}}{s^T x_o} + \frac{s^T \left(I - A_o^d\right)^{-1} \Delta y^{Ex}}{s^T x_o} - \frac{s^T \left(I - A_o^d\right)^{-1} \Delta y^{Im}}{s^T x_o} + \frac{s^T r}{s^T x_o} \quad (5.a)$$

, where s^T a summation (row) vector, r the residual vector, and the subscript o indicates the initial year of the differences process. Concerning a specific economic sector –e.g. the sector i– the growth rate is decomposed as follows

$$\frac{e_i^T \Delta x}{e_i^T x_o} = \frac{e_i^T \left(I - A_o^d\right)^{-1} (\Delta A \circ H)\, x_o}{e_i^T x_o} + \frac{e_i^T \left(I - A_o^d\right)^{-1} (A \circ \Delta H)\, x_o}{e_i^T x_o} + \frac{e_i^T \left(I - A_o^d\right)^{-1} \Delta y^{DHC}}{e_i^T x_o} + \frac{e_i^T \left(I - A_o^d\right)^{-1} \Delta y^{DG}}{e_i^T x_o} + \frac{e_i^T \left(I - A_o^d\right)^{-1} \Delta y^{DI}}{e_i^T x_o} + \frac{e_i^T \left(I - A_o^d\right)^{-1} \Delta y^{Ex}}{e_i^T x_o} - \frac{e_i^T \left(I - A_o^d\right)^{-1} \Delta y^{Im}}{e_i^T x_o} + \frac{e_i^T r}{e_i^T x_o} \quad (5.b)$$

, where e_i^T a unit (row) vector corresponding to the specific sector. It is notable that each of the first seven terms includes the domestic Leontief inverse multiplied with the temporal difference of one and only of our components of growth. This is the result of the differences process, but it also serves so that each of the first seven terms contains the effect of one particular economic variable to the growth rate –e.g. the first term contains the effect of technological change to the growth rate, the second term contains the effect of domestic absorption changes to the growth rate, etc.[4]

Using these two relationships we will study how the growth rates of the German economy and some of its important sectors are explained by the main economic variables we presented, and we will consequently see which of these variables plays the greatest part. Furthermore, using the technical coefficients a_{ij} and the domestic absorption index h_{ij}, we will attempt to identify the changes observed in its productive structure, that are associated with technological changes (and are depicted on the technical coefficients) or with international relations (that are depicted on the domestic absorption index).

The input-output tables we use are form 2000 till 2014 and are structured with 54 industries, plus the households and the extraterritorial organizations. The tables were obtained from the World Input Output Database, and were to be treated as Timmer *et. al.* (2015) describe[5].

[4] Equations (5.a) and (5.b) are the extended version of equation (8) in Appendix A.2 of Franke and Kalmbach (2005). The authors of this work do not decompose domestic demand in household consumption, government spending and investment, but we decided to do so for a more clarified work.

[5] We wished to use data from the unification of Germany, but input-output tables were not available at the WIOD before 1995. From the two releases (2013 Release and 2016 Release), we decided to use the second, thus beginning from 2000, because the structures of the tables for the two releases were not compatible and the major political events took place after 2000 – including the Neue Ostpolitik, the Agenda 2010 and the Euro-Crisis.

At first we will compute the domestic and the import coefficients from the domestic and imported inputs; then we will obtain from them the technical coefficients, that will compose the technology matrix A. After that we will compute the domestic absorption indices for all 54 industries. Taking the final demands of each sector as decomposed in the tables, we can also take a look on the exports of these sectors as percentage of the total exports; thus we can discriminate the industries that were highly exporting and contributed mostly to the exports of the country. Using the same method for the total outputs and the total imports of each sector, we can also identify the industries that are highly contributing to the total output of the German economy, and the industries that are importing a great majority of their intermediate consumption. From here on, we will study the highly exporting sectors using the method described above, so as to take a closer look on the modern-day state of the German economy and procced to a deeper understanding of its huge trade surpluses.

The industries discriminated by the procedure will also be studied in the case of France, as a means of comparison of the state of Germany to that of an equally developed and economically powerful country. The reason for choosing France is not difficult to understand: it is considered the second strongest country in the EU –especially after Brexit– and the country that rivaled Germany during most of their history, and found on it a valuable ally the previous few decades.

Empirical Evidence of the Study

At first, we identify the highly exporting industries, the highly importing industries and the highly output-contributing industries, from their shares of the total figures. From the table A.1, we can easily see that the highest exporting industry –from 1995 till 2014[6]– is the Manufacture of Transport Equipment (motor vehicles, trailers and semi-trailers), followed by the Manufacture of Machinery and Equipment, Manufacture of Computer, Electronic and Optical Equipment, and Manufacture of Chemical Products. It is interesting to observe that these industries are also highly importing industries. As for the output-contributing sectors, we can see that –and it is not hard to guess why– two of the services industries (Renting of Machinery and Equipment and Real Estate Activities) are taking the first places; the Constructions follow for the first nine years, and only after that the Manufacture of Transport Equipment (motor vehicles, trailers and semi-trailers) and the Manufacture of Machinery and Equipment are observed to enter the top five seats, with Human Health and Social Work Activities –yet another service– taking easily the fourth and then the third place, and the Public Administration and Defense holding the fifth for many years.

It should probably not go unnoticed that in countries like Germany, constructions, human health and social work, public administration and defense are sectors highly

[6] In this part, we make use of both releases (2013 and 2016), since the sectors we obtained from the first correspond to the sectors we obtained from the second ; this is feasible here, since we match one sector to another, not 54 to 33.

supported –if not owned– by the state. Furthermore, the above are typical activities – mostly services– for a developed country.

The notation used here is the NACE Coding of industries; the description of industries is given at the table B.1, at the Appendices.

TABLE A.1
Industries with High Shares in Exports, Imports and Output

	Exporting Industries	Importing Industries	Output-Contributing Industries
1	C29	C24	J71-74
2	C28	C26	L68
3	C26	C20	C29
4	C20	B	F
5	C24	C29	Q
6	C10-12	M69-70	O84
7	G46	C17	C28

Our study here will emphasize on the three highest exporting industries, notably the Manufacture of Transport Equipment (motor vehicles, trailers and semi-trailers), the Manufacture of Machinery and Equipment and the Manufacture of Computer, Electronic and Optical Equipment. These industries jointly constitute the 37% of the German exports at 2000, a percentage that seems to be preserved intertemporally; as a result, they are clearly the steam engine of Germany's European and international economic policy.

Using equation (5.a) we can compute the growth rate and its components for both the German and the French economy, on their total. The results are presented at the following two tables. It is important to remember that the growth rate is given by output and not by value added as in usual computations – the two numbers are expected to differ quite much. In order to realize both the clarity of our method and the typical value of a growth rate given by output, one can use the table B.2 in the Appendices, where both the computed and the actual growth rates, along with the residual, are presented.

TABLE A.2:
Growth Rates and Decomposition for the German Economy

	Technology	Domestic Absorption	Households Domestic Demand	Government Domestic Demand	Companies Domestic Demand	Exports Demand	Imports Demand	Growth Rate
2000-2003	0,229%	0,2278%	11,259%	4,0104%	0,5152%	10,9052%	2,44%	24,70671%
2004-2009	1,7829%	-0,898%	7,1814%	3,7278%	1,5326%	9,9351%	2,5308%	20,7309%
2010-2014	-0,33%	-0,735%	2,7069%	2,1211%	1,2849%	8,0472%	1,5995%	11,4957%

TABLE A.3:
Growth Rates and Decomposition for the French Economy

	Technology	Domestic Absorption	Households Domestic Demand	Government Domestic Demand	Companies Domestic Demand	Exports Demand	Imports Demand	Growth Rate
2000-2003	0,9246%	0,9297%	13,9129%	6,568%	6,5403%	6,0768%	2,739%	32,2133%
2004-2009	0,8209%	-0,805%	10,6571%	5,5279%	5,3098%	4,6052%	2,3538%	23,7623%
2010-2014	0,4976%	-0,688%	1,0455%	1,4307%	1,0798%	4,125%	1,4644%	6,0265%

What is already interesting to note is that the contribution of technology to the growth of the two major European economies is relatively small; equally small is the contribution of domestic absorption of inputs. These alone can tell us that the huge growth observed in these two countries, especially Germany, is not explained by great technological changes. So, the question naturally arising is where do they come from. If we attempt to resolve this by thinking on the demand-side, we are forced to

discriminate between the domestic demand for final goods (for household consumption, government spending and investment) and the external demand for final goods (the net exports or the current accounts).

Concerning the domestic demand, we can observe that both countries had quite a great demand for consumption from households and respectable contributions from government spending and investment during the first period (2000-2003). However, all three of them present a decline during the next periods. We can see Germany entering a soft austerity after 2003 –when Schröder agenda was applied– which slowly but effectively restricted the consumption and the government spending, however we do not see a counterbalancing rise in investment. On the opposite, France reduces significantly all three components of domestic demand for final goods only after the economic depression appears, thus the results are clearly seen only during the third period (2010-2014).

The decline in the growth rate of France during the third period, and consequently the great growth rates of previous periods, seem to be explained naturally by domestic demand, especially by the consumption of households. However, the same cannot be told for Germany. The –earlier– restrictions of domestic demand has not slowed down the German economy; on the contrary, the growth rate it present after 2009 and during the Euro-crisis, becomes greater than that of France, which was greater in the previous periods. The explanation can only arise from the external demand. Germany has constantly a positive current account, but it also has relatively greater demand for exports than any other – especially during the second and third periods. As a result, we can name the exports as the main contributor to the expansion of German economy, and not the comparative advantage of higher technology or greater efficiency, as it is usually claimed.

To make this an even clearer result, we will focus on the three highest exporting industries we have resulted to before (C29, C28 and C26); and to make our study even simpler we will focus at first on three inputs of each sector, that are found to have the highest technical coefficients over the years, meaning that the dependence of each of these three sectors to its three main inputs is rather high and very significant. For the C29 sector, the three inputs are taken from the C29, C24 and C25 sectors; for the C28 sector the inputs are from the C28, C25 and C24 sectors; for the C26 sector the inputs are from the C26, G46 and C25 sectors. It is highly interesting that all three industries have products of their own as intermediate consumptions, meaning they are highly dependent on themselves.

The three technical coefficients of each of the three German industries under study are shown on the graphs following. Each graph is depicting the temporal evolution of these coefficients. It is followed by a comparison of these technical coefficients of the very same sectors between France and Germany; here the German coefficients are subtracted from their French counterparts, so their differences are much more easily shown.

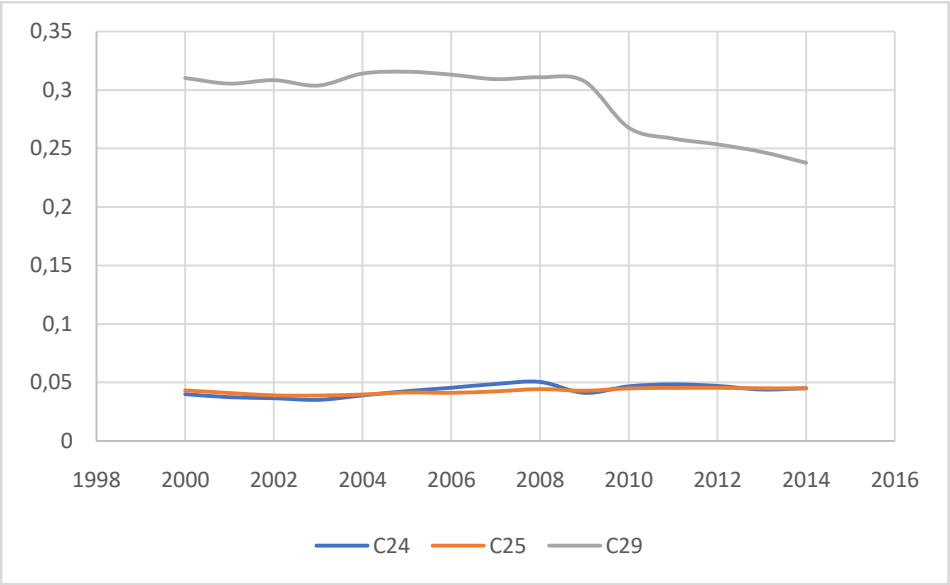


Figure 1: C29, Technical Coefficients, Germany
Source: WIOD, Author's calculations

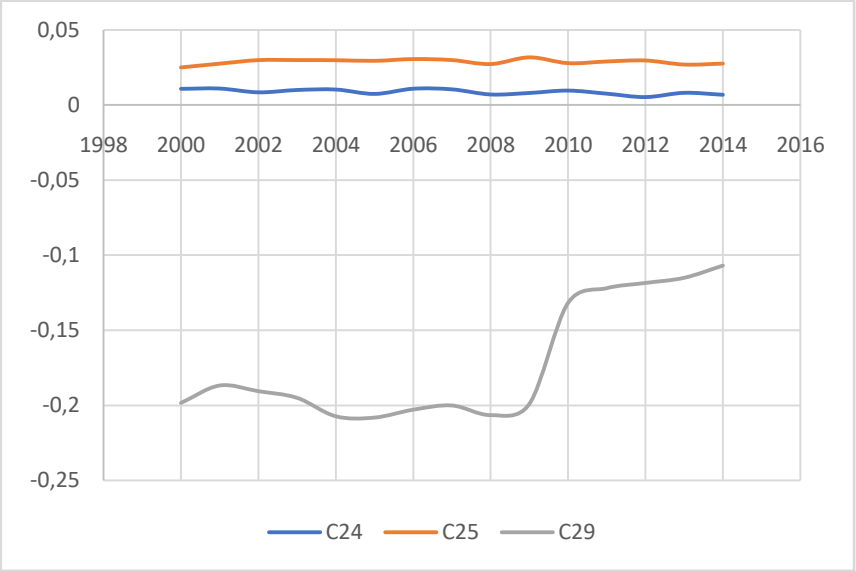


Figure 2: C29, France and Germany Comparison
Source: WIOD, Author's calculations

As we can see from figure 1, the sector C29 (Manufacture of motor vehicles, trailers and semi-trailers) technical coefficients denoting inputs from the sectors C24 and C25, remain fairly stable after 2009. However, the C29 technical coefficient, denoting its own inputs, is decreasing after 2009. According to figure 2 France's respective sector, uses relatively more inputs from the sectors C24 and C25, while Germany respective sector uses more self-inputs.

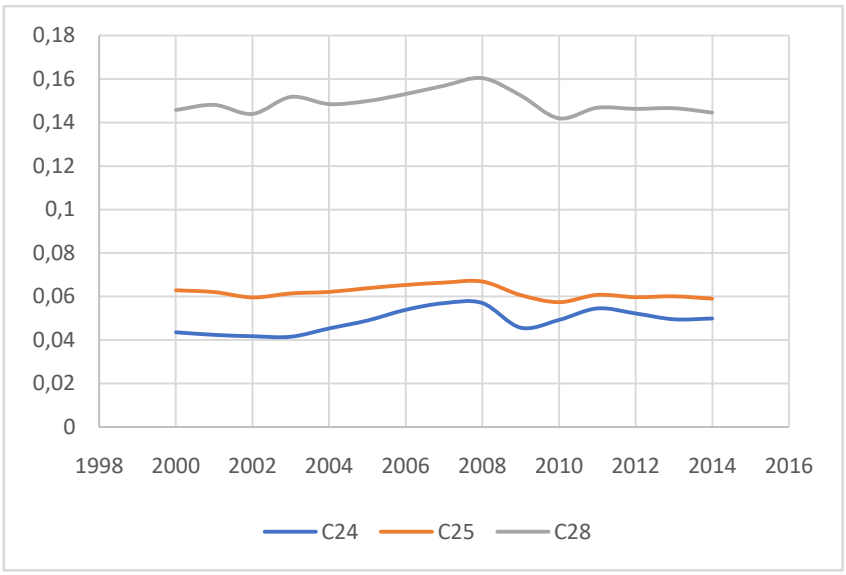


Figure 3: C28, Technical Coefficients, Germany
Source: WIOD, Author's calculations

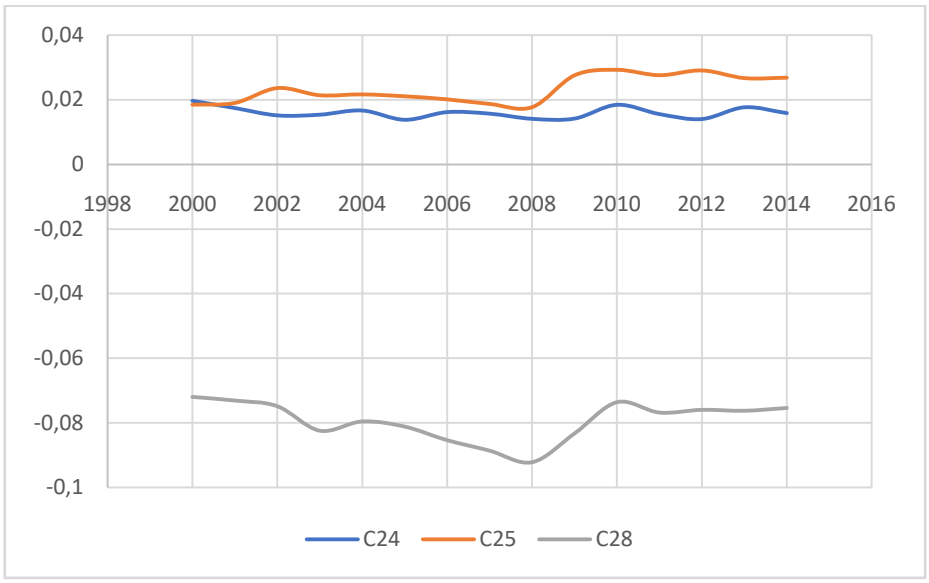


Figure 4: C29, France and Germany Comparison
Source: WIOD, Author's calculations

Concerning sector C28 (Manufacture of machinery and equipment n.e.c.), we can see that the technical coefficients, denoting inputs from the sectors C28 and C24 remain stable after 2011, while the sector's self-input coefficient, remains stable from 2009 and onwards (figure 3). As in the sector C29 case, we observe that the sector C28 differences between French and German technological coefficients follow the same pattern (figure 4).

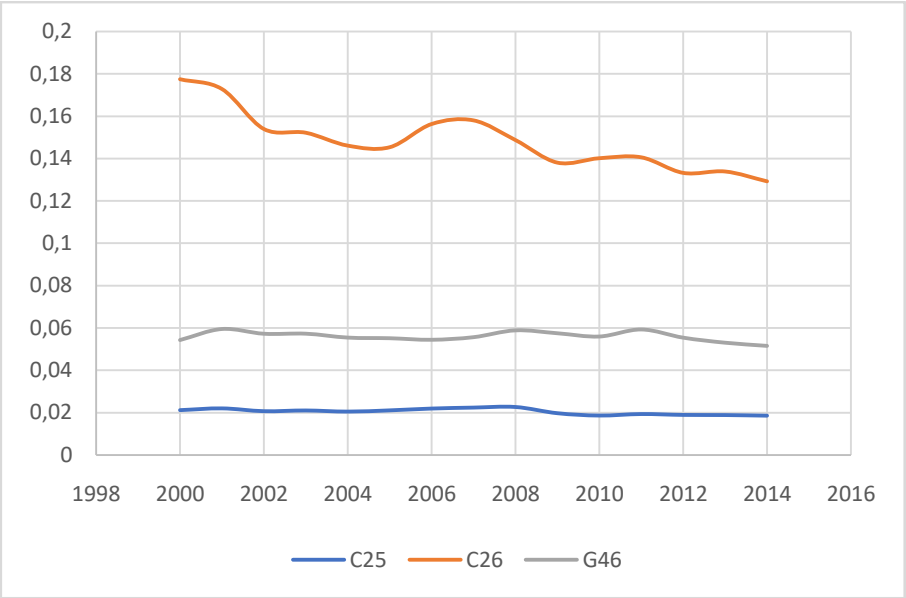


Figure 5: C26, Technical Coefficients, Germany
Source: WIOD, Author's calculations

Figure 6: C26, France and Germany Comparison
Source: WIOD, Author's calculations

According to the last diagram (figure 5) the sector C26 (Manufacture of computer, electronic and optical products) technical coefficients, regarding inputs from the sectors C25 and G46, are fairly stable, while the sector self-input coefficient is decreasing (diagram 6). What is interesting about the differences between France's and Germany's technical coefficients of the sector C26, is that French technical coefficient increased during the 2008-2009 period (figure 6).

Following the same technique for the domestic absorption index, we can observe that the import penetration of each product for each industry presents a general increasing tendency. The corresponding diagrams are presented in Appendix B.

Going beyond these simplified techniques, we can attempt to use equation (5.b) and decompose the growth rates of the three sectors to their explaining economic

variables, as we did the overall growth rate of the economy [7]. The results of our calculation are presented on the following table.

TABLE A.4:
Growth Rates and Decomposition for the Highest Exporting German Industries

	Technology	Domestic Absorption	Households Domestic Demand	Government Domestic Demand	Companies Domestic Demand	Exports Demand	Imports Demand	Growth Rate
	2000-2003							
C29	0,0379%	0,0378%	8,3268%	0,1887%	-2,946%	32,3071%	6,8211%	31,1313%
C28	0,8526%	0,8524%	1,7156%	0,1792%	4,8051%	20,2547%	1,767%	26,8927%
C26	-1,928%	-1,928%	-0,239%	0,1867%	-3,199%	18,3383%	2,8091%	8,421%
	2004-2009							
C29	-0,93%	-0,913%	5,2652%	0,2218%	2,7689%	3,7894%	0,9286%	9,2736%
C28	0,8228%	-1,39%	1,1408%	0,198%	-3,718%	25,095%	5,0017%	17,1477%
C26	-0,336%	-0,382%	-0,501%	0,217%	1,3826%	-4,532%	-0,84%	-33,1208%
	2010-2014							
C29	-1,452%	-1,692%	2,2505%	0,0532%	-3,022%	22,0271%	3,6686%	14,4963%
C28	0,3711%	0,1979%	0,629%	0,1032%	1,7133%	15,1167%	2,2144%	15,9169%
C26	-0,309%	-0,018%	0,853%	0,0793%	-2,533%	8,3942%	0,7323%	5,7335%

We can observe the same computations for France in the next table, as a means of comparison. The same periods and the same specific sectors were computed, so that the comparison would be straight.

TABLE A.5:
Growth Rates and Decomposition for the French Economy and Specific Sectors

	Technology	Domestic Absorption	Households Domestic Demand	Government Domestic Demand	Companies Domestic Demand	Exports Demand	Imports Demand	Growth Rate
	2000-2003							
C29	-0,105%	-0,105%	7,8685%	0,0813%	-0,213%	24,5447%	9,813%	22,2591%
C28	-1,851%	-1,85%	1,8016%	0,4234%	3,8423%	21,5365%	5,4001%	18,5031%
C26	-2,38%	-2,38%	2,498%	0,4029%	1,9783%	-12,252%	-0,846%	-11,2861%
	2004-2009							
C29	-0,015%	0,2068%	5,0837%	0,0176%	0,5841%	-20,386%	6,1383%	-20,6465%
C28	-0,044%	-1,225%	1,0641%	0,3036%	-3,624%	10,1047%	2,0695%	4,5099%
C26	-1,273%	-0,445%	2,2384%	0,2178%	-1,211%	-13,538%	-3,678%	-10,3322%
	2010-2014							
C29	-0,349%	-0,468%	-6,846%	0,0319%	-2,195%	3,4552%	4,0807%	-10,4527%
C28	0,2495%	-0,58%	-0,154%	0,0506%	0,447%	15,3242%	6,0883%	9,2489%
C26	-0,687%	-0,247%	-2,23%	0,0235%	-1,76%	-2,636%	-2,019%	-5,5172%

We can easily see that in all three main exporting industries the technological change that is observed is not significant enough to explain the large growth rates of the German economy, or of these industries themselves. We know, from the main equations of the Input-Output system that a *ceteris paribus* improvement of the technology as depicted by the technical coefficients, is acting positively on the output causing its increase as well; in our case though the output of these sectors is expected to fall or to remain stable –if there is no sufficient counterbalancing force, coming probably from the labor inputs. As a result, we would expect the exports of Germany to decrease during the Euro-Crisis –at least from 2010 until 2014; yet it is a common knowledge that German exports have kept their rising tendency during this period, while their increase can be traced back at 2000, which again is not fully explained from the technical coefficients behavior.

[7] Again, this growth rate is computed by output and not by value added.

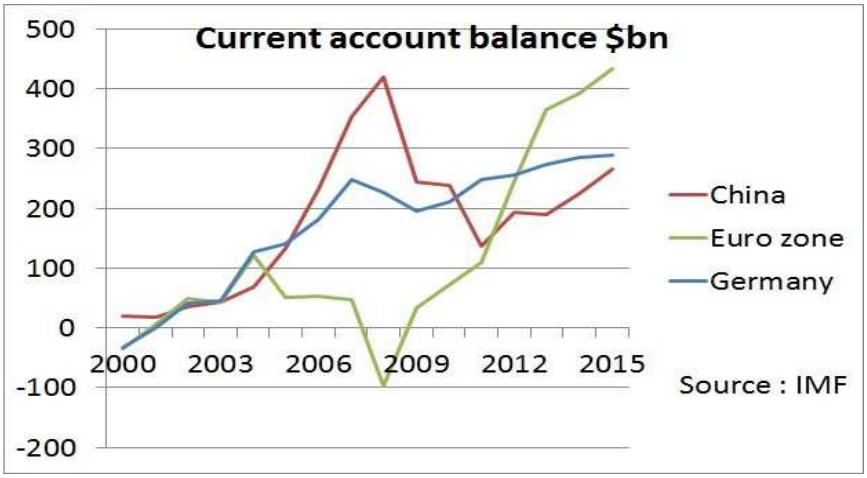


Figure 7: The Trade Surpluses of China, Euro-Zone and Germany, 2000-2015

Simply looking simultaneously at the evidence for both Germany and France, it is easy to understand that the growth rates of Germany are to be attributed to its high external demands, at least for some final products. It is certainly not to be attributed to their high technological development or their numerous innovations, since these do not seem to improve the effectiveness of their main exporting industries or of the overall economy. It is our opinion that the answer to this "German economic miracle" lies most probably at the political choices Germany has made these last decades, both internally and externally, and to these we will focus.

WHEN ECONOMICS IS A POLITICAL ARGUMENT…

All Roads Lead to the East

After the "reunification", the Federal Republic of Germany decides to seek new vital economic space. Until then the priorities of Western Germany were completely within the European Space, and France was the one who opposed the orders of Federalism; as an example, the Treaty of Rome did not prohibit the countries from capital controls. Western Germany had pursued more freedom of capital mobility within the Community, against the will of the Fifth French Republic.

Since 1991 the Federal Republic of Germany determines its geopolitical horizons from scratch. It turns towards the East and inaugurates a New Eastern Policy (Neue Ostpolitik), nothing as much as the strategy of W. Brand. The New Eastern Policy is an aggressive economic advance.

The origins of this turn can be traced back in 1993, when the chancellor H. Kohl launched the Asian Concept. In fact, it is but a political agenda intended to encourage the German Industry and drive investments in the Asian Continent and mostly in China[8]. Since then, the Sino-German relationship are structured on the mutually beneficial (win-win) trade and it is not incidental that each German chancellor visiting China is accompanied by representatives of the German business elite.

Since 2004 Germany and China are self-characterized as being in a "Strategic Partnership in Global Responsibility", deepening their diplomatic and economic

[8] Deutsche Welle,40 years of Sino-German relations

relationships with further cooperation of their Central Banks and their Ministries of Finance[9]. It is most clearly stated by the German Ministry of Foreign: "With bilateral trade worth 169.9 billion euros, China surpassed France (167.2 billion euros) and the United States (164.7 billion euros) in 2016 to become Germany's most important trading partner."[10] France is no longer the main trade partner of Germany. The French-German Axis is degraded by the Sine-German Alliance, at the very least in its economic part. Studies of the Federal Statistic Service are also stating this; according to them "German exports to China stabilized again in 2016 after experiencing a moderate decline the previous year. According to Federal Statistical Office (Destatis) figures, German exports to China increased by around 6.95 percent, to 76.1 billion euros, compared with 2015, while German imports from China in the same period grew by 2.5 percent to more than 93.8 billion euros."[11]. It's not incidental that China opened its first Chamber of Trade in Germany. Besides that, China is the fourth greater importer of German products, following France, the United States and the United Kingdom, and the main buyer of German vehicles, after the United States and the United Kingdom[12]. The European states are still the principal importers of German products, yet the exports to China are constantly increasing, while the European economies are seemingly withering[13].

It is a fact that the two world exporting champions remain self-complementing economies (Δουράκης, 2013). China exports to Germany labor intensive products of mass consumption and Germany exports to China capital equipment, cars and "flashy luxury" goods for the Chinese elite. Yet, the "Communist" Party of China has announced a turn towards the internal market; combined with the protectionism announced by President Trump, it can destroy Berlin.

As discussed, the trade-investment in one of the axes of this New Eastern Policy, with the energy and the industrial being the other. Germany has chosen a long-term strategic alliance with Russia (an oil- and gas-selling-based country) so that it can provide the economy with energy sources, with the 40% of its needs being covered by Moscow.

The Nord Stream submarine pipeline, that bypasses the Baltic countries and supplies Germany with gas directly, belongs to these very plans. Chancellor G. Schröder decided to fund the pipeline and this policy was not overturned by his successor. This movement was proved highly advantageous for Germany, considering the extremely unstable environment of nowadays Middle East after the Arabian Spring and the current civil war in Syria.

[9] Auswärtiges Amt-Federal Foreign Office
[10] Auswärtiges Amt-Federal Foreign Office
[11] Auswärtiges Amt-Federal Foreign Office
[12] Auswärtiges Amt-Federal Foreign Office
[13] Furthermore, the German exports of Food and Beverages in China were increased about 1,1 billion Euros at 2015. Consequently China remains one of the most important overboard markets of the German consumer goods. Concerning the investments, 5000 German companies are active in China, while 31% of Chinese investments in Europe are in Germany.

Figure 8: The Nord Stream Submarine Gas Pipeline, coming from Russia straight to Germany.

Following the same policy, German Industries are allocated in the countries of the former Eastern Bloc, exploiting the combination of low labor cost of these countries and the industrial culture and technical know-how the former possessed. At the same moment, they use these activities of theirs in forcing the German Unions to accept the labor market deregulations and the German Government to adopt lower tax coefficients. This is another, intermediate effect of Neue Ostpolitik in the inside of Germany (Δουράκης, 2013).

Germany has created a powerful chanel towards the East, which it wishes to preserve. Not accidentally, it opposed intensely when the EU asked for tariffs on Chinese photovoltaics, out of fear for a systematical turn of China to frontline products.

Agenda 2010

The Origins of the German Hegemony

At the 14th of May 2003, the chancellor of Germany, G. Schröder, presents in a speech of his at the German Parliament, the Agenda 2010, with the slogan "courage for peace and courage for change" (Schröder, 2003a). According to him, "Our Agenda 2010 programme contains far-reaching structural reforms and offers incentives for boosting employment, consumption and investment. It will help ensure that equity is maintained between the generations and help strengthen the foundation of our state." (Schröder, 2003a) The proposed package of reforms resulted after a serious structural crisis, characterized by high levels of unemployment and zero growth rates; Schröder made clear from the start that these reforms would not only help Germany escape this depression but also strengthen it in the international markets. At the same time, the German chancellery linked these reforms to the European Treaty of Lisbon.

Schröder's reforms are the mere triggering of the 235 billion Euros trade surplus of Germany for 2016. This is why we will examine here some of the crucial points of the Agenda 2010, mostly concerning the economy.

Social Insurance System

One of the main problem the German chancellery is facing is the "demographic ageing" of its population and the long-term change of the employed-pensioners ratio.

The population pyramid confirms this[14]. As a result, a series of reforms was adopted in the insurance system and the health system so that their future viability would be ensured[15]. Private insurance programs were established and the level or provisions was readjusted in 2004, based on a viability coefficient that would account the employed-pensioners ration. Furthermore, the early retirements were limited and soon enough (at 2008) the retirement age was moved to 67[16]. According to the chancellery, the reduce of employers' and employees' levies (along with the concomitant cuts) made the German exports much more competitive. The reforms in the insurance and the deregulating reforms in the labor market drove the employment to rise, according to the following graph.

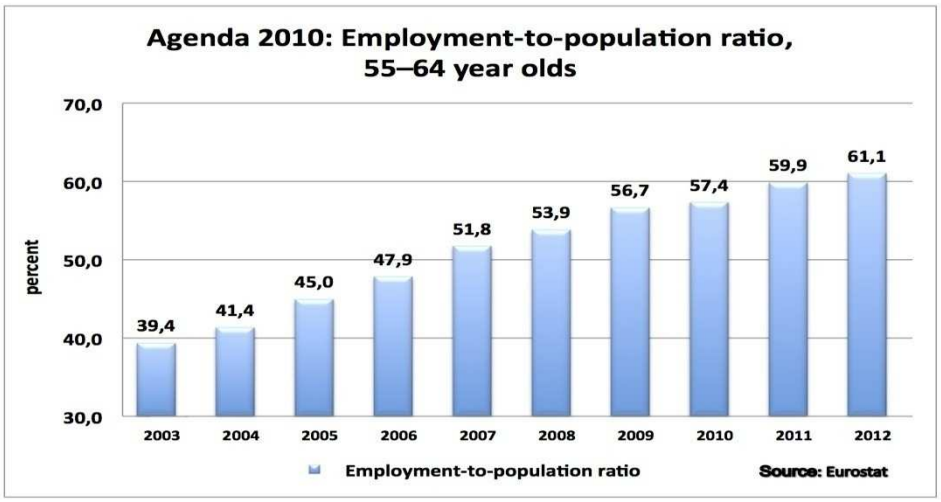


Figure 9: The Employment-Population Ratio, 55-64 year-olds, from the announcement of the Agenda 2010.

Labor Market

The reforms in the labor market were outcomes of the P. Hantz experts' committee proposition. These new policies have extended the institution of temporary employment and "low wages"[17]. At the same time, the partial employment was established by law and the protection umbrella for the workers[18]. Based on the expectations of new employees being employed if there were sufficient demand and advantageous trade consequences, without the fear of having to keep them in case of economic worsening. Out of fiscal reasons, the unemployment allowance was decreased and equalized to the social aid. The period of the unemployment allowance payment was also decreased to 12 months from 32[19]. As a form of penalty, the allowance was also cut completely if the unemployed do not accept the chances they are given for a job. Despite the short-run weaknesses, the measures were finally proved to be successful.

[14] German Population Pyramid .
[15] Social Insurance Reforms
[16] Social Insurance Reforms
[17] Labor Market Reforms
[18] Labor Market Reforms.
[19] Labor Market Reforms.

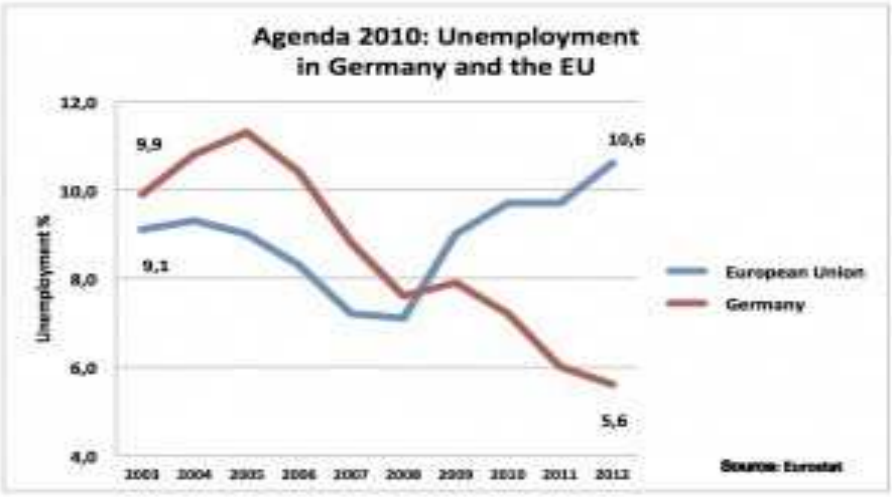


Figure 10: A Comparison of the Unemployment Rates in Germany and the European Union, ever since the announcement of the Agenda 2010.

Taxation

Generally, the tax reforms included a tax decrease for all income ranks. The lowest tax coefficient was reduced from 25,9% to 15% and the highest was reduced from 53% to 42%[20]. The taxes on companies were also decreased so that the German companies would not leave Germany; in fact, the coefficient of this tax fell form 40% to 25% and the local taxes fell in the case of small and medium businesses.

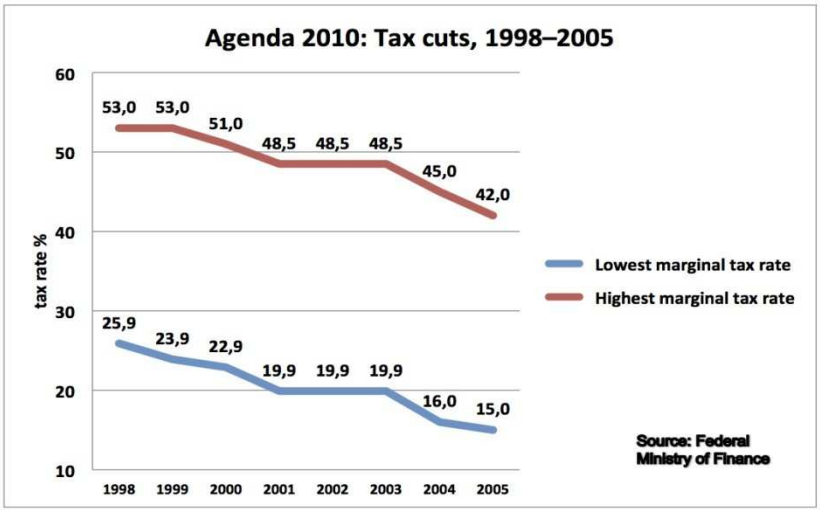


Figure 11: The Limits of German Tax Rates before and after the Agenda 2010 was applied.

Consequences

The great competitiveness of Germany is greatly due to the policies adopted in the Agenda 2010. The sheer fall of labor costs, the flexibility of the labor market after the deregulation, the decrease of the tax coefficients has assured great profits for the German and enforced the competitiveness of German economy. The surplus of the German trade balance can be explained mostly by these reforms and by the stability of the real wages, while the labor productivity was increasing.

[20] Tax System Reforms

The policies proposed by the German chancellor –and followed ever since by all Berlin governments, Social democratic or Christian democratic– were something completely new for a European economy, even beyond the monetarist counterattack at 1970's. The German exports exploited the expansionary policies and the high levels of purchasing power other countries citizens had, while the high savings rate ensured the duration, the effectiveness and the sufficiency of the German investments. It also appears as if the soft euro helped Germany (something the U.S.A. have accused it for), and that can be another reason for the German exports increase after the great depression of the Euro-zone after 2010.

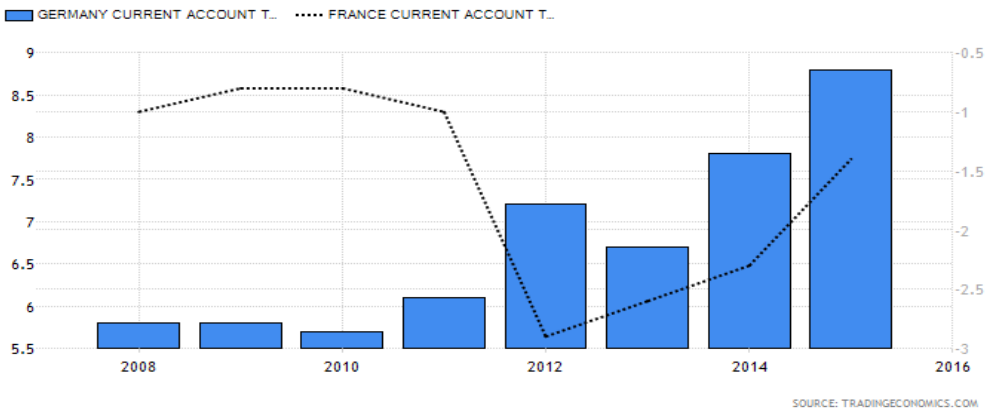


Figure 12: A Comparison between the German and the French Current Accounts.

As for the unemployment, Germany indeed presents really small percentages: 3,9% at April 2017, instead of 9,1% in 2003. This however was only caused because of the much cheaper jobs and the early expansion of partial employment.

Euro Pact Plus, Wages and Germany

The united Europe via the EMU and EZ obtained a monetary leg. Yet, a firm fiscal background did not exist and the member-states had a discretion in the matter of the wage policy; this was settled with the Treaty of Lisbon (Article 153.5). Of course, the macroeconomic policy of the European Union influenced the wages, but not immediately.

However, since 2010 and following the debt crisis and the deep structural Euro crisis, the EU is constantly trying to coordinate the fiscal part of its members. With the initiative of Germany and France at March 2011 in the Summit Meeting of the EU state leaders, the Euro Pact Plus was approved in order to secure the Euro and fortify the European economies from the public debt crisis[21]. The most important novelty that was adopted was the creation of a permanent mechanism to support the economies facing deficits; this is the European Financial Stability Facility (EFSF), the processor of the European Stability Mechanism (ESM).

In this context, the European Council at April 2011 enforced its previous decisions (Brussels, March 2011) and defined the EU strategy by the following directives. Among them it was decided that the progress of competitiveness would be evaluated

[21] Euro Plus Pact

by the progress of the wages, of the productivity and of the needs to adjust this competitiveness; this means that the evolution of the wages of labor (measures by the unit labor cost for a certain period and for each country and crucial economic sector) should follow the evolution of productivity. The European governments were called to take action concerning the social debates and the labor relations, so that the above decisions would be fulfilled (European Political Strategy Centre, 2015).

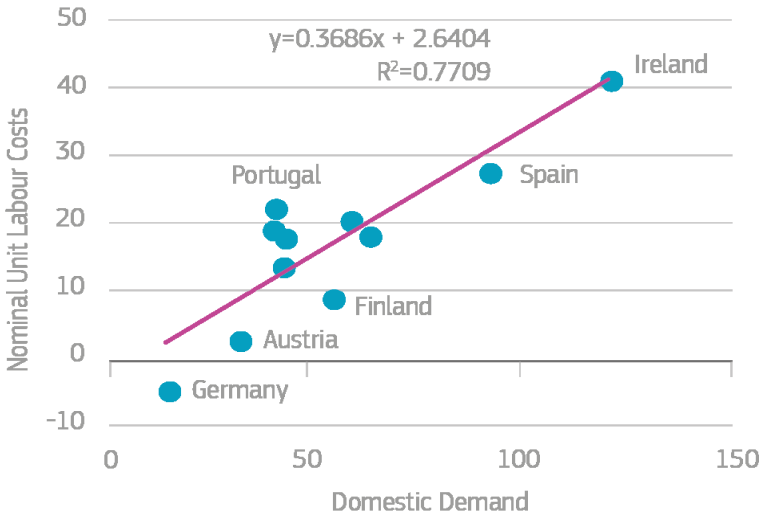


Figure 13: The implied relationship of Domestic Demand and Nominal Unit Labor Costs for the European countries, as well as the special case of Germany.

It is obvious from the diagram above, that Germany has certainly achieved a goal of competitiveness. Yet, it is also obvious that the wages in Germany do not follow the productivity intertemporally. Consequently, the other European economies are facing a rather odd wage dumping that is not at all in compliance with the common strategy chosen by the European Council. The European Commission itself, the arm of executive power of the EU and one of its main legislative instrument, via László Andor, European Commissioner for Employment, Social Affair and Inclusion, strongly criticized the government of Berlin; he noted that this situation is going on for about ten years. According to him, Germany should increase its government spending and give a boost to demand, lowering at the same time the high trade surpluses that are harming its European partners. The rising of wages is crucial (Der Spiegel, 2013). Similar calls were headed to Germany from France.

Conclusions

As we can clearly see from above, the main exporting sectors of Germany, do not present any serious technological changes. Thus, the question arises: why is Germany's Current Account balance constantly positive? Is Germany on the winning side of a "race to the bottom", as France and the United States insisted by accusing the German government of wage dumping? The other explanation could be the euro itself. According to economic theory if Germany had the mark as its national currency, with this size of Current Account surplus and without intervention in the currency markets, the mark should appreciate. In this context, the euro is a tool with

which German exporting enterprises can buy cheap intermediate goods in a globalized market in order to transform them at high value added goods.

References

1. Berstein, S. and Milza, P. (1997). *Ιστορία της Ευρώπης, Τόμος Τρίτος: 1919 έως Σήμερα – Διάσπαση και Ανοικοδόμηση της Ευρώπης*. Μετάφραση: Κοκολάκης Μ. Αθήνα: Εκδόσεις Αλεξάνδρεια. [*Histoire de l'Europe contemporaine*. Paris: Hatier (2002)]
2. Deutschewelle (2012). "40 years of Sino-German relations".
   http://www.dw.com/en/40-years-of-sino-german-relations/a-16299632
   Date of last visit: 02/06/2017.
3. Δουράκης, Γ. (2012). "Το δόγμα της αέναης λιτότητας [The dogma of perpetual austerity]". *Το Βήμα*.
   http://www.tovima.gr/opinions/article/?aid=441958
   Date of last visit: 02/06/2017.
4. Δουράκης, Γ. (2013). "NEUE OSTPOLITIK: «Γερμακίνα», το ανατολικό όραμα της γερμανικής στρατηγικής [NEUE OSTPOLITIK: «Deutschina»", the eastern vision of german strategy"] . *afterhistory.blogspot.gr*
   http://afterhistory.blogspot.gr/2013/10/neue-ostpolitik.html
   Date of last visit: 02/06/2017.
5. European Political Strategy Centre (2015). *The Euro Plus Pact*.
   https://ec.europa.eu/epsc/publications/strategic-notes/euro-plus-pact_en
   Date of last visit: 02/06/2017.
6. Der Spiegel (2013). "EU Social Affairs Comissioner: Wages in Germany Must Increase".
   http://www.spiegel.de/international/europe/eu-social-affairs-commissioner-wages-in-germany-must-increase-a-897120.html
   Date of last visit: 02/06/2017.
7. Franke, R. and Kalmbach, P (2005). "Structural change in the manufacturing sector and its impact on business-related services: an input-output study for Germany". *Structural Change and Economic Dynamics*, 16 (4): 467-488.
8. Heywood, A. (2011). *Εισαγωγή στην Πολιτική*. Μετάφραση: Καράμπελας, Γ. Αθήνα: Εκδόσεις Πόλις. [*Politics*. Palgrave McMillan (2007)]
9. Hobsbawm, E.J. (2010). *Η Εποχή των Άκρων: Σύντομος Εικοστός Αιώνας 1914-1991*. Μετάφραση: Καπετανγιάννης, Β. Αθήνα: Εκδόσεις Θεμέλιο. [*The Age of Extremes: The Short Twentieth Century, 1914-1991*. London: Abacus (1994)]
10. Kennedy, P. (1987). *The Rise and Fall of the Great Powers: Economic Change and Military Conflict from 1500 to 2000*. New York: Random House.
11. Miller, R.E., and P.D. Blair (2009). *Input-Output Analysis: Foundations and Extensions*. Second Edition. Cambridge: Cambridge University Press.
12. Population Pyramid.
    https://www.populationpyramid.net/germany/2003/
    Date of last visit: 02/06/2017.
13. Schröder, G. (2003). "Courage for Peace and Courage for Change: Policy Statement by Federal Chancellor Gerhard Schröder in the German Bundestag".
    http://gerhard-schroeder.de/en/2003/03/14/speech-agenda-2010/

Date of last visit: 02/06/2017.

14. Schröder, G. (2003). *Agenda 2010: Reforms.*
    http://gerhard-schroeder.de/en/startseite/reforms/
    Date of last visit: 02/06/2017.
15. Timmer, M. P., Dietzenbacher, E., Los, B., Stehrer, R. and de Vries, G. J. (2015). "An Illustrated User Guide to the World Input–Output Database: the Case of Global Automotive Production". *Review of International Economics*, 23: 575–605.

Appendix A: Sector NACE Codes

TABLE B.1: NACE Codes for the Industries referred in the paper	
B	Mining and Quarrying
C10-12	Manufacture of Food Products, Beverages and Tobacco Products
C17	Manufacture of Paper and Paper Products
C19	Manufacture of Coke and Refined Petroleum Products
C20	Manufacture of Chemicals and Chemical Products
C24	Manufacture of Basic Metals
C26	Manufacture of Computer, Electronic and Optical Products
C28	Manufacture of Machinery and Equipment n.e.c.
C29	Manufacture of Motor Vehicles, Trailers and Semi-Trailers
F	Construction
G46	Wholesale Trade, except of Motor Vehicles and Motorcycles
J71-74	Renting of Machinery & Equipment and other Business Activities
L68	Real Estate Activities
M69-70	Legal and Accounting Activities; Activities of Head Offices; Management Consultancy Activities
O84	Public Administration and Defense; Compulsory Social Security
Q	Human Health and Social Work Activities

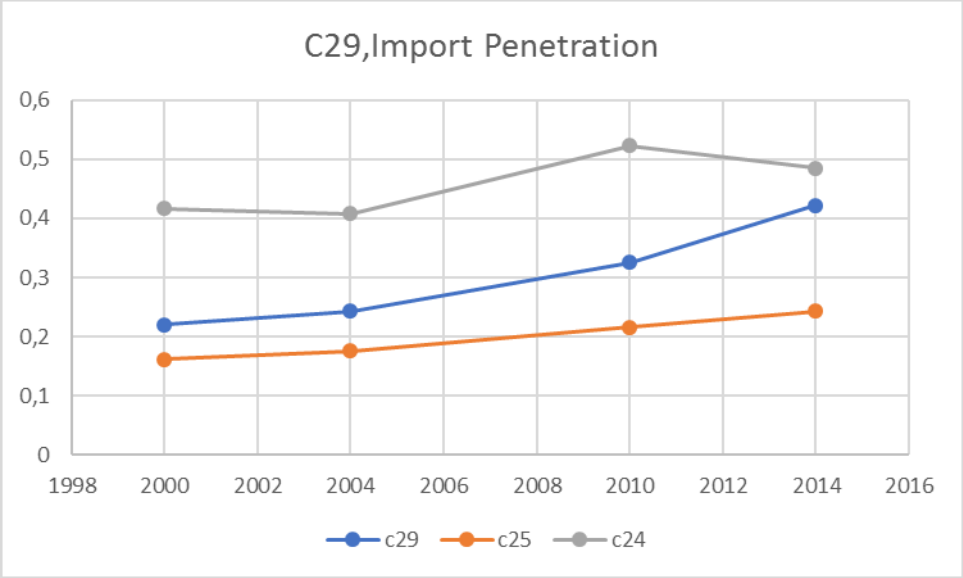
Appendix B: Actual and Computed Growth Rates

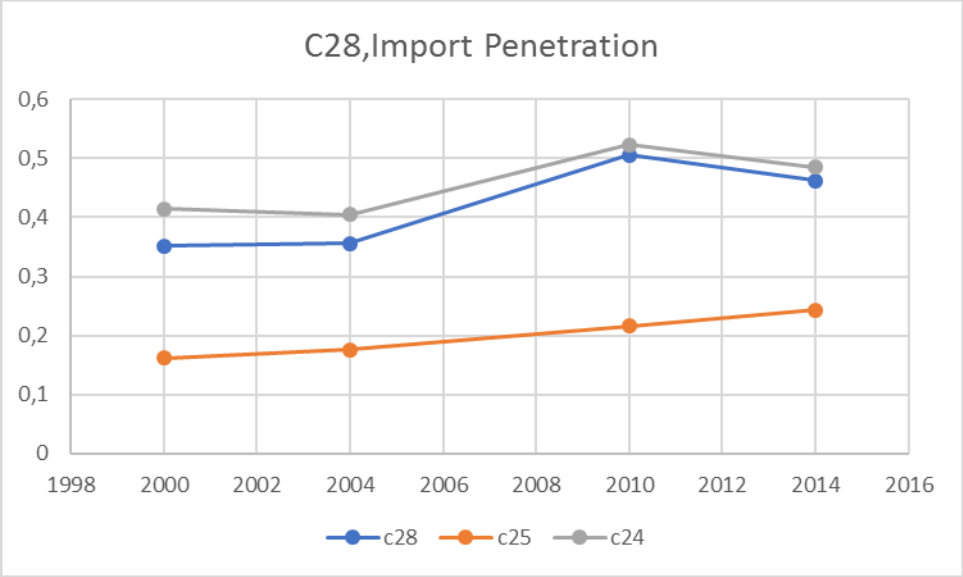
TABLE B.2: The Actual and Computed Growth Rates for the German Economy

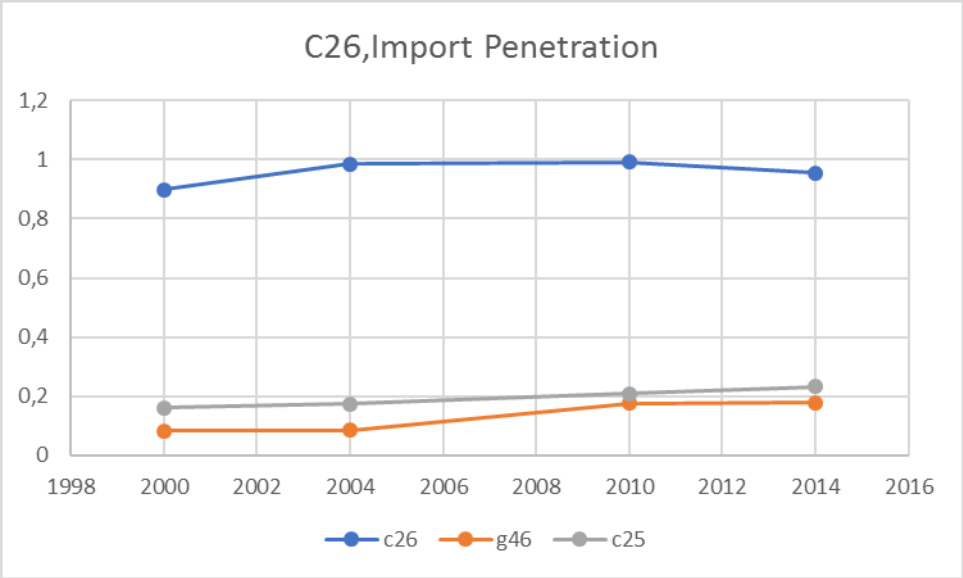
	Actual Growth Rate (by data)	Computed Growth Rate	Residual
2000-2003			
Overall Economy	27,7431%	24,7067%	-3,036%
C26	9,1311%	8,421%	-0,71%
C28	28,3619%	26,8927%	-1,469%
C29	36,3638%	31,1313%	-5,232%
2004-2009			
Overall Economy	24,1499%	20,73088%	-3,419%
C26	-5,4687%	-3,3121%	2,1566%
C28	20,1338%	17,1477%	-2,986%
C29	5,1468%	9,2736%	4,1257%
2010-2014			
Overall Economy	11,6088%	11,4957%	-0,113%
C26	7,6281%	5,7335%	-1,895%
C28	19,1677%	15,9169%	-3,251%
C29	14,665%	14,4963%	-0,169%

TABLE B.3: The Actual and Computed Growth Rates for the French Economy			
	Actual Growth Rate (by data)	Computed Growth Rate	Residual
2000-2003			
Overall Economy	33,4227%	32,2133%	-1,209%
C26	-7,4351%	-11,2861%	-3,851%
C28	22,5212%	18,5031%	-4,018%
C29	28,0727%	22,2591%	-5,814%
2004-2009			
Overall Economy	27,4007%	23,7623%	-3,638%
C26	-22,2581%	-10,3322%	11,9259%
C28	1,0897%	4,5099%	3,4201%
C29	-29,3929%	-20,6465%	8,7464%
2010-2014			
Overall Economy	6,8856%	6,0265%	-0, 859%
C26	-12,3181%	-5,5171%	6,801%
C28	11,8913%	9,2489%	-2,642%
C29	-8,9452%	-10,4527%	-1,508%

Appendix C: Import Penetration




C28,Import Penetration
0,6
0,5
0,4
0,3
0,2
0,1
0
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
c28
c25
c24


C26,Import Penetration
1,2
1
0,8
0,6
0,4
0,2
0
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
c26
g46
c25