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Evolution of trade patterns and economic performance: the case of France and Switzerland during the nineteenth century

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Avantages comparatifs et performance commerciale: le cas de la France et de la Suisse pendant la première mondialisation

Résumé

En mobilisant deux bases de données originales, construites à partir des statistiques du commerce extérieur de la France et de la Suisse, cet article utilise un niveau produit très désagrégé pour analyser le type, la nature et la dynamique des spécialisations françaises et suisses pendant la première mondialisation. Malgré des différences en matière d'environnement économique entre les deux pays, l'article souligne des tendances communes en ce qui concerne les trois aspects de la spécialisation. Notamment, l'article met en avant l'existence d'échanges intra-branches dans les deux cas, type d'échanges jusqu'ici très peu étudiés par l'historiographie. L'article avance donc l'hypothèse que les caractéristiques de la main d'œuvre ainsi que les choix de politiques économiques ont permis à la Suisse, d'adapter la structure de ses avantages comparatifs à la demande mondiale, et de connaître un « miracle » économique.

Mots-clés : Avantages comparatifs, croissance économique, première mondialisation

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Abstract

Using two original databases, built from external trade statistic of France and Switzerland, this article uses a highly disaggregated product-level to analyze the type, the nature and the dynamic of French and Swiss specialization. Despite of differences between France and Switzerland in terms of economic environment, this article underlines some common trends regarding the three aspects of specialization. For instance, the article shows that intra-industry trade flows were occurring between both countries and their partners. The articles also emphasizes that the skilled labor force as well as the choice of a 'right' economic policy allowed Switzerland to adapt its comparative advantage structure to the world demand, and to enjoy a fast economic growth.

Keywords: Comparative advantages, economic growth, first globalization

JEL: F13, N13, O2

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Introduction

The insertion of countries into the globalization is a highly strategic issue. From that perspective, the globalization that occurred during the 19th century does not differ from the actual one, starting at the beginning of the 20th century. During the first globalization, the insertions' strategies are mostly based on exports' increase (Thornton, 1997), which is closely linked to political strategy in terms of commercial policies. For some countries, the development of exporting industries was based on tariffs policy (Lains, 2006; Chang, 2002; Harris et al., 2015) whereas for others it is rather based on the signature of free-trade treaties (Schularick and Solomou, 2011; Lampe, 2009, 2011).

Theoretical and empirical studies have been made to question the link between export growth and economic growth (Helpman and Krugman, 1985; Konya, 2006) and it seems acknowledged that there is a positive relationship between both variables. Nevertheless, it is still interesting to interrogate the mechanisms that drive this relationship. A lot of studies highlight the importance of the choice of the specialization set for the economy to strengthen the positive link between exports and economic growth (Bensidoun et al., 2001). Among these studies, Dalum et al. (1999) stresses the importance of specialization into activities offering high levels of technological opportunities and/or areas with high income elasticities to foster economic growth. Hausmann et al. (2007) shows that countries which export goods associated with higher productivity levels grow more rapidly. In the same vein, Villa (1993) advises countries to be specialized in industries that drove the rest of the economy, which means industries with positive externalities. Finally, according to Busson and Villa (1997), a country specialized in an industry which benefits from a high world demand should base its development on inter-industry trade. Otherwise, it should develop an intra-industry specialization that will tend to promote economic growth.

Given those results, it is interesting to have a closer look at the French and Swiss specializations during the first globalization. First, both of these countries experienced very different economic growth rates during the period. Second, there are economic differences between an old country with stagnant rates of openness and 'young' country with a high level of openness. French economy is then opposed to the 'miracle' of a very dynamic Swiss economy. Beyond classical arguments to explain this difference in terms of economic success (home market size (David, 2009a, 2009b), institutions' quality (David and Mach, 2006), labor cost…), it is necessary to interrogate the type, the nature and the dynamics[1] of specializations to understand the evolution of export flows and consequently the level of economic growth.

This paper analyzes the strategies established in France and Switzerland on the three aspects of specialization. Considering differences between both countries, we assume that Switzerland has decided to implement a different strategy than France on the three aspects of specialization, which was efficient in terms of commercial performances.

[1] The type of specialization is defined as the share of inter-industry and intra-industry trade as percentage of the total trade. The nature of specialization corresponds to the comparative advantages of exports for the French and Swiss economy, from the industries point of view as well as at the products detail. Dynamics of the specialization shows the evolution of the comparative advantages structure.

Related to this, studies on French and Swiss specializations and external trade during the 19th century are well referenced. Some articles use benchmark years (Verley, 1988) while others only use total trade flows or highly aggregated data (Weiller, 1971; Bairoch, 1989). Considering studies on Swiss economy, Veyrassat (1990) only analyses total export flows, when Bairoch (1996) goes more into products decomposition, but only for four years (1840, 1890, 1900 and 1912). Therefore, despite the huge number(s) of studies on French and Swiss specializations during the 19th century, they faced limits that might be explained by a relative lack of perspective at present regarding historical data. That's why this article analyses the type, the nature and the dynamics of French and Swiss specializations using two databases from national statistical yearbooks of external trade what makes this study original thanks to the highly disaggregated data collection. Considering the nature of our data (export and import flows), specialization of each country is studied in terms of external trade of national industries or at a product level.

The paper is organized as follows. Section 1 presents our databases and the different methods used to analyze the specialization. Section 2 shows and analyses empirical results.

1. Material and research methodology

Our study of French and Swiss specialization is based on two original databases as well as the use of several indexes and statistical methods well identified by the empirical literature. The aim of this section is to present the material and the research methodology employed to answer our research question.

First, to investigate more precisely the commercial specialization of France and Switzerland, a lot of sources can be used. Some studies are based on industrial value added (Bourgain et al., 2000) while others use employment and labor productivity data (Dormois, 2008). If these different data are available for recent periods thanks to the work of researchers or national and international institutions, it is not so obvious for some historical periods.

Facing a lack of available data, we have decided to lead our empirical study using historical data, collected by national institutions in charge of external trade and customs. From these statistics of French and Swiss external trade we have exploited two databases. The first one gathered export and import flows between France and its commercial partners over the period 1836 to 1913. The unreliability of these statistics before 1850 (Schuller, 1911) and the aim to compare France and Switzerland lead us to calculate the majority of our indexes over the period 1850 to 1913. Data on French external trade has been collected by the GREThA research team (UMR CNRS 5113) from the 'Tableau général du commerce de la France avec ses colonies étrangères' became 'Tableau général du commerce et de la navigation' after 1896. The second database gathered export and import flows between Switzerland and its partners from 1885 to 1913. We are aware that this period can appear limited to study nature and dynamic of Swiss specializations but statistics are only available from 1885 as the political will to equip Switzerland with reliable statistics is not appear until 1860. This date corresponds to the creation of Swiss Federal Statistical Office but it is only with the Federal council order dated October 10th 1884 coming into effect on January 1st 1885 (« Notice explicative sur les tableaux comparatifs de la statistique du commerce suisse embrassant la période 1885-1895 », 1897) that the first external trade book has been print. We have collected data from 'Statistiques du

commerce de la Suisse avec l'étranger'. For some indexes, we have split our period in two sub-periods corresponding to a change of the products' classification.

Table 1 summarizes principal characteristics of each database.

Table 1 : summarize of databases	France	Suisse	
	1850-1913	1885-1906	1906-1913
Number of products' categories	4	17 or 35	15, 49 or 54
Number of products per year (nomenclature)	156	1123	1339
Number of products really traded	88 (6,06)*	728 (51)*	1306 (14)*
Level of disaggregation	SITC rev. 3, 2 digits	SITC rev. 3, 4 digits	
Classification of operations	Special trade	Special trade	

*mean per year.
Standard deviation in brackets

Both databases allow to analyze external trade at different level of disaggregation. Basically, the French database offers two level of disaggregation: either the detail of products traded between France and its partners or a classification of products into 4 categories. This classification has been made by the French Customs Administration and roughly corresponds to the four economic sectors: primary products, agricultural products, manufactured goods and other products[2]. Swiss database offers different level of disaggregation. The customs nomenclature sorts products into 17 (15 after 1906) or 35 categories (49 or 54 after 1906)[3]. We first use the most aggregated nomenclature and then enter into detail to determine industries where Switzerland has advantages.

Once the data selected, we have lead our empirical study in order to characterize the specializations of French and Swiss economies from three aspects: the type, the nature and the dynamic. For each of these three aspects, we have used indexes or statistical methods well-known by the international trade literature.

In order to study the type of country's trade specialization, we have calculated, per year, a Corrected Grubel and Lloyd index (CGL) defined as follows:

$$CGL = \frac{\sum_{i=1}^{n}(x_i + m_i) - \sum_{i=1}^{n}|x_i - m_i|}{\sum_{i=1}^{n}(x_i + m_i) - |X - M|}$$

Where x_i (m_i) is the value of exports (imports) of product i and X (M) is the value of total exports (imports).

The CGL index is a Grubel and Lloyd index built from corrected flows of the country's trade balance (Michaely, 1967)[4]. We choose a corrected index in order to respond to criticism of the standard index

[2] Agricultural products gathered all products from land cultivation (cereals, natural fertilizer), livestock (animals and pieces of animals), and all the products (processed or not) intended to household final consumption (coffee, butter). Primary products gathered unprocessed raw materials required for the industrial production (cotton wool, ore, and materials) that is raw materials intended to be processed before final consumption. Then, manufactured goods gathered finished goods, which are all products processed as a result of human action (Pallain, 1913).
[3] For more details about the nomenclature see Appendix 1.
[4] The choice of a corrected index allows having an index not dependent on the sign of the total trade balance. Indeed, it is distributed in the trade balance of each branch in proportion to the weight of the branch in total

(Busson and Villa, 1997). Among then, standard index is highly determined by the sign of the trade balance, effect that we can prevent using a corrected index. CGL index gives a global vision of the type of specialization the country promoted.

To study the nature of a country's trade specialization, the most commonly used indicator is the 'Revealed Comparative Advantage' (RCA) defined by Balassa (1965). Unfortunately, this index could not have been used in our study for at least two reasons. First, the RCA index compares the country's export structure with that of the world. Considering the 19th century, we do not have available data on the world trade at a products level using harmonized nomenclature. Second, the RCA index only focuses on export flows. This constitutes a limit considering the existence of intra-industry trade flows during the period. That is why, using national statistics on both export and import flows we prefer to use a Lafay index (Lafay, 1992)which is able to capture intra-industry trade flows and to control for distortions due to business cycle. More precisely, following Federico and Wolf (2011)[5] and Alessandrini et al. (2010) we modify the standard index as follows:

$$LFI_i = 100 * \left[\frac{x_i - m_i}{x_i + m_i} - \frac{X - M}{X + M}\right] * \frac{x_i + m_i}{X + M}$$

Where x_i (m_i) is the value of exports (imports) of product i and X (M) is the value of total exports (imports).

This formula indicates that the comparative advantage for a country in product i is the deviation of the product normalized trade balance (that is divided by the total product flows) from the overall normalized balanced trade. This difference is weighted by the share of trade of product i (imports plus exports) on total trade. Thus, the sum of LFI across i for any year must by construction be equal to zero. In other words, a country is specialized when the product trade balance is higher than the total trade balance. Same method is used to measure comparative advantages of an industry: the subscript i now corresponds to the industry and not to the product anymore. Positive values of the Lafay index indicate the existence of a comparative advantage in a product i (or an industry). The larger the value, the higher the degree of specialization is. To the contrary, negative values indicate a disadvantage or a de-specialization (Zaghini, 2003).

Then, to determine the dynamic of the country's specialization pattern, we proceed in two steps. First, in order to understand if the specialization pattern has changed over time, we run the simple following OLS regression following (Zaghini, 2003, 2005) based on the work of Pavitt (1988) and Cantwell (1989):

$$IS_i^{END} = \alpha_i + \beta_i IS_i^{BEG} + \varepsilon_i \qquad i = 1, \ldots . N$$

Where the dependent variable corresponds to the distribution of a given international specialization index at the end of the time sample, the exogenous variable is the distribution of the same index at

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trade. We negate the effect of total trade balance $(X - M)$by distributing it between each branch balance $(x_i - m_i)$ while taking account of the weight of the branch in total trade $(\frac{x_i - m_i}{X+M})$.

[5] The index of Lafay (1992) uses a weighting of the export and import flows by the share of each sector (or products) in the Gross Domestic Product (GDP). Suffering from a lack of Added Value data per sector, we have replaced this weighting by the weight of the product (or sector) in total trade. This adjusted index reveals an advantage (or a disadvantage) of a country comparing to its own trade structure.

the beginning of the period, α and β are the standard linear regression parameters and ε is the residual term. Adapted to the French and Swiss cases OLS regressions take the following form:

$$LFI_i^{1912-1913} = \alpha_i + \beta_i LFI_i^{1850-1851} + \varepsilon_i \qquad i = 1, \ldots .126 \quad (1)$$

$$LFI_i^{1904-1905} = \alpha_i + \beta_i LFI_i^{1885-1886} + \varepsilon_i \qquad i = 1, \ldots .943 \quad (2a)$$

$$LFI_i^{1912-1913} = \alpha_i + \beta_i LFI_i^{1906-1907} + \varepsilon_i \qquad i = 1, \ldots .1324 \quad (2b)$$

These regressions link a dependent variable corresponding to the distribution of the mean of the Lafay index at the two-years ending the period (1912-1913 for France and the second Swiss sub-period, 1904-1905 for the first Swiss sub-period) with an exogenous variable corresponding to the distribution of the mean of the Lafay index at the two-years beginning the period (1850-1851 for France, 1885-1886 and 1906-1907 respectively for the first and the second Swiss sub-period) (REF). Facing a change in the Swiss nomenclature and a change of the products' heading, we have choosen to split our sample in two sub-periods corresponding to the two different nomenclatures.

The interpretation of the linear regressions' results is straightforward (Chiappini, 2011). The value of the β would capture the changes over time in the pattern of specialization. A β_i equal to 1 means that the specialization pattern has remained unchanged over time. A β_i coefficient greater than 1 shows that the country has become more (less) specialized in products or sectors in which it already had a competitive advantage (disadvantage). To the contrary, a coefficient ranges from 0 to 1 denotes that on average the signs of the specialization pattern have remained the same but the index improved in sectors with initial low values and worsened in sectors with initial high values. Then, in the very specific case where β_i is lower than 0, the specialization ranking has reversed.

It should be noticed that this method do not analyzed the determinants of the initial specialization pattern. The aim is only to compare two cross-sections at two points in time and there is no element of time across the observations.

That is why the analysis of the regression coefficient is not enough to conclude about variation in the degree of specialization. Regression coefficients only give information on what happen on average. To interrogate more precisely the changes that occurred in the dispersion of the distribution of the Lafay index, we can exploit this following relation deriving from the regression equations (Zaghini, 2003):

$$\frac{V(LFI^{END})}{V(LFI^{BEG})} = \frac{\beta_i^{\,2}}{\rho^{2}} \quad (3)$$

Where $V(LFI^{END})$ and $V(LFI^{BEG})$ are respectively the variance of endogenous and exogenous variable and ρ^{2} the square of the correlation coefficient. When $\beta_i = \rho$ the dispersion of the distribution remains unchanged. When $\frac{\beta_i}{\rho} > 1$, the degree of specialization has increased (rise in

the dispersion) whereas when $\frac{\beta_i}{\rho^2} < 1$, the degree of specialization has decreased (reduction in the dispersion).

The second step to determine the dynamic in the specialization pattern has consisted to calculate for each country a transition matrix. This method was first implemented in the analysis of cross-country convergence (Quah, 1993,1996) and then imported in the international trade analysis by Proudman and Redding (2000) and Brasili et al. (2000).

Following Quah (1993, 1996) and Proudman and Redding (2000), lets denote LFI index by the measure x and $F_t(x)$ its distribution across products at time t. Corresponding to F_t, we may define a probability measure λ_t where $\forall x \in \Re$:

$$\lambda_t\big((-\infty, x)\big) = F_t(x) \quad (4)$$

The evolution of the distribution of LFI over time can be now modeled in terms of a stochastic difference equation:

$$\lambda_t = P^*(\lambda_{t-1}, u_t), \qquad integer\ t \qquad (5)$$

Where $\{u_t, integer\ t\}$ is a sequence of disturbances to the entire distribution and P* is an operator tracking where points in F_{t-1} end up in F_t. We assume here that this stochastic difference equation is first order and that the operator P* is time-invariant. By setting the disturbances u to zero and iterating the stochastic difference equation forward, we obtain:

$$\lambda_{t+s} = (P^*)^s \lambda_t \qquad \forall s \in N \quad (6)$$

If the space of possible value of LFI is divided into a number of distinct and discrete intervals, P* becomes a matrix of transition probabilities (also called a Markov matrix), where the value of each cell turns out to be a transition probability. In other words, each cell corresponds to the probability that a product beginning in a given cell i at time t moves to another distinct cell j at time $t + s$ characterized by a different specialization level.

We have presented in this section the data and statistical methods we have used in the paper. Section 2 presents the result of our empirical analysis.

2. Empirical results

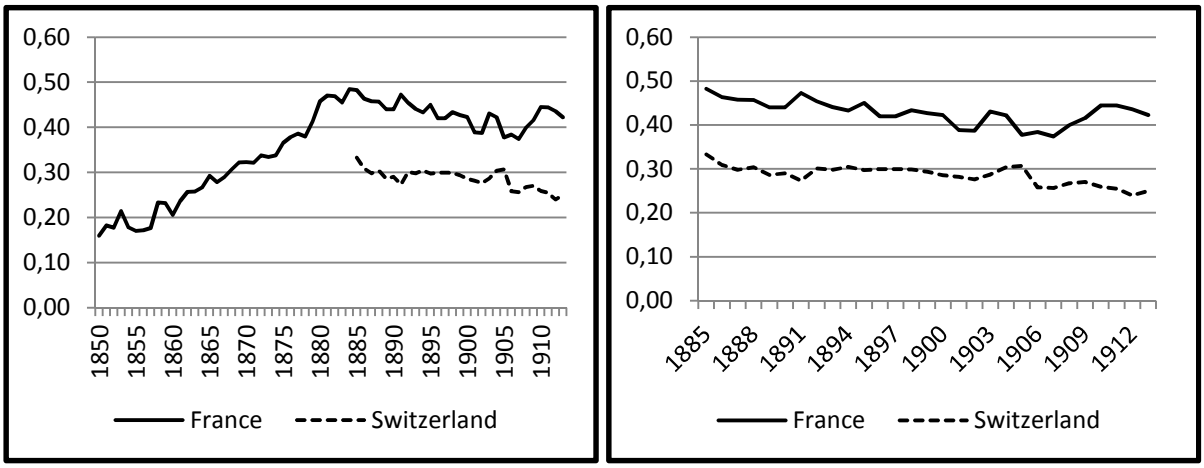
The empirical analysis we have done in this paper is structured around the three aspects of a country's specialization we presented in the introduction. This section presents the results achieved for the type, the nature and the dynamic of French and Swiss specialization.

Type of specialization

The type of a country's specialization can be understand through the share of inter and intra-industry trade in total trade. To determine these shares we have calculated for the

French and Swiss economy a CGL index for the period 1850 to 1913 (left side) and for the period 1885 to 1913 (right side) (Figure 1)

Figure 1: CGL index evolution for France and Switzerland (1850-1913 and 1885-1913)



Sources : « Tableau du commerce de la France avec ses colonies » et « Statistique du commerce de la Suisse avec l'étranger ». Own calculation.

Results show a trend towards specialization in intra-industry trade for both countries. From the end of the 1880s intra-industry trade represents more than 30% of total trade in France and Switzerland. French economy is nevertheless the most involved in this type of specialization as the share of intra-industry trade in total trade varies between 40 and 50% from the 1880. Furthermore, France seems to experience a gradual commitment in intra-industry trade. The share of this type of specialization goes to less than 20% in 1850 to almost 50% in 1885. Concerning Switzerland, the intra-industry trade commitment seems to be stable from 1885 to 1913.

Our study underlines the importance of intra-industry trade in France and Switzerland. This result is categorically opposed to classical international trade theories. It is so necessary to lead new studies on the 19th century based on a careful reading of the historical data and new international trade theories. In fact, this type of trade has not been study a lot for the 19th century (Messerlin and Becuwe, 1986; Huberman et al., 2015) as the belief in the country's specialization depending on international division of labor and in the comparative advantage theory is still very strong among economists.

A first explanation of economic performance differences between France and Switzerland can be found in the gradual commitment of France in intra-industry trade. Contrary to Switzerland, France benefits from an international openness thanks to its seafronts. Until 1860, France gives priority to inter-industry trade with developing countries such as the United States, Latin American countries or its colonies in Africa and Asia. After 1860, French exports to long distance markets suffer from a lack of penetration and from the American civil war and so France turns its strategy to proximity markets (Becuwe et al., 2015). This move towards less distant markets leads France to change its inter-industry specialization into an intra-industry one. This strategy has been supported since 1860 with the conclusion of free-trade agreements with geographically closed countries. Nevertheless, despite a reorientation towards proximity markets, France has been competed with countries with the same specializations but with well-established market shares like Switzerland. Facing constraints on

geographical isolation and on the relative little size of the home market, Switzerland strengthens external trade with countries sharing a common border and bases its development on exports.

Nature of specialization

Nature of specialization has been study thanks to the Lafay index calculation. This index reveals advantages and disadvantages of an economy considering products' exports. Table 2 and 3 shows Top 5 of products' strength and weakness for France and Switzerland.

Table 2: Comparative advantage and disadvantage of French economy

Top 5 strength		Top 5 weakness	
	1850		
Silk textiles and Silk floss	11,08	Cotton Wool	-6,62
Wool textiles	5,37	Silks	-5,63
Cereals	3,17	Loose Wool	-2,95
Wine	2,84	Sugar	-2,84
Cotton textiles	2,83	Coal (Raw, Burned and Aggregate)	-2,28
	1870		
Silk textiles and Silk floss	8,20	Loose Wool	-3,19
Wine	3,90	Cereals	-2,53
Wool textiles	3,16	Cotton Wool	-2,34
Products from 'Parisian industry'	2,12	Sugar	-2,17
Refined sugar and Brown sugar (Vergeoise)	1,48	Common wood	-2,05
	1890		
Wool textiles	4,15	Cereals	-3,94
Silk textiles and Silk floss	3,00	Loose Wool	-3,89
Products from 'Parisian industry'	2,11	Coal (Raw, Burned and Aggregate)	-2,57
Skin or Leather work	1,89	Oleaginous fruits and seeds	-2,18
Lingerie and Cloths	1,71	Cotton Wool	-1,95
	1913		
Silk textiles and Silk floss	2,47	Loose Wool	-3,82
Cotton textiles	2,43	Cereals	-3,25
Loose Wool	2,22	Coal (Raw, Burned and Aggregate)	-3,10
Products from 'Parisian industry'	1,82	Cotton Wool	-2,66
Lingerie and Cloths	1,75	Oleaginous fruits and seeds	-2,28

Sources : « Tableau du commerce de la France avec ses colonies » et « Statistique du commerce de la Suisse avec l'étranger ». Own calculation.

This table highlights a strong French specialization in textiles and in particular those made of silk and wool. Beyond these two products, France is specialized in manufactured goods that require an expertise in terms of fabrication process or methods. These specializations are very well-known on international market and reveal the French 'know-how' (especially for the 'Parisian industry goods' and wines). The structure of French comparative disadvantages consists of mainly raw and

agricultural products. Concerning agricultural goods (in particular cereals), the comparative advantage at the beginning of the period turns into a disadvantage since the 1870s. Nevertheless, it is hard to draw a general conclusion as many others exogenous factors can influenced cereal crop. Broadly speaking, it seems that the strong French comparative advantages at the beginning of the period crumbled over time whereas the structure of comparative disadvantages stays relatively stable.

Table 3 presents Swiss main comparative advantages and disadvantages.

Table 3: Comparative advantage and disadvantage of Swiss economy

Top 5 strength		Top 5 weakness	
	1885		
Machine embroidery	5,78	Wheat	-3,74
Pure Silk textiles	4,35	Cotton Wool	-2,24
Cheese	2,84	Wool textiles	-2,20
Pocket watch with silver box	2,61	Silk (thrown), Silk thread (organsin)	-2,19
Pocket watch with gold box	2,09	Cask wines	-1,53
	1895		
Pure Silk textiles	4,49	Wheat	-3,04
Plumetis: trim (cotton)	3,44	Silk (thrown), Silk thread (organsin)	-2,24
Hard cheese	2,57	Coal	-1,60
Pocket watch with silver box	2,32	Cotton Wool	-1,55
Pocket watch with golden box	2,24	Ox	-1,51
	1905		
Pure Silk textiles	4,52	Wheat	-2,76
Plumetis: trim (cotton)	4,24	Natural cask wines	-1,69
Pocket watch with golden box	2,33	Silk (thrown), Silk thread (organsin)	-1,54
Hard cheese	2,16	Coal	-1,53
Pocket watch with silver box	1,63	Cotton Wool	-1,16
	1913		
Embroidery of plumetis (cotton)	5,34	Wheat	-3,17
Silk products : single piece production	3,34	Coal	-1,47
Hard cheese	2,36	Cotton Wool	-1,34
Gold watch	2,09	Unwrought gold	-1,17
Chocolate	1,88	Silk thread (organsin)	-1,04

Sources : « Tableau du commerce de la France avec ses colonies » et « Statistique du commerce de la Suisse avec l'étranger ». Own calculation.

Such as France, Switzerland is specialized in embroidery, textiles as well as in luxury watches which are high-end specializations that required a strong investment in terms of human capital. The structure of Swiss comparative advantages seems yet less dominated by a single specialization than in France as we can also highlight a comparative advantage in the export of cheese and chocolate. On the disadvantage side, we mostly find agricultural products and primary products necessary to the

production of the Swiss specializations (unwrought gold for gold watch or thrown silk for textiles). For the most part, structure of Swiss advantages as well as Swiss disadvantages seems to be stable over time as changes in LFI index are not so important during the period.

The study of the nature of French and Swiss specializations gives a meaningful explanation for intra-industry trade flows in both countries. Results clearly identify a specialization in high-end products, particularly in textiles and embroidery. Corresponding demand to these high-end products could be mostly found in developed countries which are, for the most part, bordering countries. France and Switzerland have promoted a local trade with countries that are in the same situation in terms of wealth and economic development. The choice to target exports to developed countries contributes to increase the share of intra-industry trade flow in total trade.

We can now complete our first explanation of the economic performance differences between France and Switzerland. Swiss agriculture is, at this time, insufficiently developed and diversified to supply simultaneously the home market and the international one. Moreover, as the Swiss workforce being relatively cheap and well-educated (Bergier, 1984), we may assume that Switzerland turns to the production of luxury goods headed to wealthy-class from bordering countries[6](Bairoch, 1996). The low labor cost and its high education give to Swiss products a significant advantage in terms of price competitiveness as well as in terms of quality (Bouquet, 2013). Both factors can be viewed as a very likely source of Swiss comparative advantage. The gradual engagement in intra-industry trade specialization and a less educated workforce did not offer to France the opportunity to fill the gap with countries which have, like Switzerland, a well-established market shares in Europe.

Specialization Dynamic

Last aspect of specialization we would like to study is the dynamic over time. In order to study the dynamic of country's specialization we first develop an econometric approach to analyze the changes in the specialization pattern. Then, we have estimated a transition matrix (Markov matrix) for the French and Swiss specializations.

Concerning our econometric approach, we exploit regression (1) for France and (2a) and (2b) for Switzerland. Table 4 shows the results of linear regressions and those of the β/ρ comparison.

[6] In 1862, Swiss exports to Europe represent 62%. This digit goes to an average of 79.6% for the period 1892 to 1900 (Veyrassat, 1990).

Table 4: Results of the linear regression of the LFI for France and Switzerland

	France		Switzerland (equation 2a)		Switzerland (equation 2b)	
	1850-1851	1912-1913	1885-1886	1904-1905	1906-1907	1912-1913
Maximum	10.39	3.65	5.84	4.69	5.15	5.44
Minimum	-6.55	-3.83	-3.82	-3.05	-2.87	-3.01
SD[7]	1.41	0.80	0.32	0.28	0.26	0.60
Number of products with positive LFI	39	47	170	192	297	311
β	0.284***		0.487***		0.966***	
	(7.07)		(22.03)		(144.68)	
ρ	0.491		0.549		0.969	
β/ρ	0.578		0.887		0.996	
Number of observations	154		1123		1339	
Adjusted R^2	0.242		0,301		0.940	
Student t-test H_o: β=1	-0.716***		-0.513***		-0.03***	
	(-17.84)		(-23.24)		(-5.12)	

***Significant at 1%; t-statistics into brackets.

The analysis of the β gives similar conclusion for the dynamic of specializations in France and Switzerland. For both countries (and for all periods), β ranges between 0 and 1[8]. It indicates that, on average, the sign of the LFIs remains the same. Moreover, it means that on average the signs of the specialization pattern have remained the same but the index improved in sectors with initial low values and worsened in sectors with initial high values. More precisely, a β<1 shows that both countries have been the victims of the 'regression effect' (Cantwell, 1989): sectors with a disadvantage have seen their initial position improve (i.e the initial negative LFI become less important or even positive), whereas sectors with an advantage at the beginning of the period have seen their situation stagnated or diminished.

To study further the degree of specialization of the French and the Swiss economies we have reported in Table 4 the β/ρ ratio. The analysis of this ratio shows a downward trend of the degree of specialization. France β/ρ ratio equals 0.578 and indicates a reduction of the dispersion i.e. a fall in the degree of specialization. In the case of Switzerland, the period 1885 to 1905 and the period 1906

[7] SD= standard deviation

[8] As shown in the table 4, β coefficients are significantly different from 0 at 1% and significantly different from 1 at 1%.

to 1913 correspond to a decrease of the degree of specialization. Nevertheless, β/ρ ratios are close to 1 which indicates a less pronounced downward trend.

We can summarize the analysis of the β/ρ ratio as follows: both countries have experience a trend towards diversification, but it has been progressive and non-reversible in France whereas it has been quite abrupt in Switzerland. Moreover, Switzerland has known alternating periods of concentration and de-concentration until 1913[9]. It seems that Swiss economy constantly adapts itself to the change of the world economy whereas France suffers from inertia in terms of specialization's structure. Consequently, where France experienced few changes in its specialization pattern, Switzerland saw the emergence of new specializations, some switches from a negative LFI to a positive one. This demonstrates an evolution of the Swiss specializations.

To complete the view on the dynamic of French and Swiss specialization, we estimate for each country a transition probabilities matrix. To facilitate comparison across countries, we calculate for both countries a matrix for each sub-period corresponding to the Swiss data. Table 5 summarizes the result.

Table 5: Transition probabilities in France and Switzerland, 1885-1905 and 1906-1913

	1885-1905 (transition sur 20 ans)						1906-1913 (transition sur 7 ans)					
	France						France					
	I	II	III	IV	V		I	II	III	IV	V	
I	0.73	0.13	0.00	0.07	0.07	I	0.94	0.06	0.00	0.00	0.00	
II	0.22	0.50	0.22	0.06	0.00	II	0.06	0.76	0.18	0.00	0.00	
III	0.12	0.06	0.53	0.24	0.06	III	0.00	0.22	0.50	0.22	0.06	
IV	0.00	0.08	0.08	0.67	0.17	IV	0.00	0.00	0.29	0.65	0.06	
V	0.00	0.00	0.00	0.31	0.69	V	0.00	0.05	0.00	0.21	0.74	
	Suisse						Suisse					
	I	II	III	IV	V		I	II	III	IV	V	
I	0.60	0.24	0.05	0.04	0.07	I	0.82	0.14	0.01	0.01	0.02	
II	0.22	0.45	0.22	0.07	0.04	II	0.13	0.60	0.16	0.05	0.05	
III	0.02	0.20	0.45	0.21	0.12	III	0.02	0.17	0.54	0.21	0.06	
IV	0.04	0.08	0.25	0.57	0.07	IV	0.01	0.01	0.11	0.78	0.10	
V	0.06	0.03	0.13	0.06	0.73	V	0.02	0.03	0.06	0.08	0.81	

The analysis of those matrices is simple. Each cell (i, j) contains the probability that an item in the specialization category i at time t transits to the specialization category j at time t+n (in the 20-year transition matrix, n=20). Each specialization category, identified by a number from I to V, corresponds to the division of our statistical series into quantile. The first quantile gathers negative LFI whereas the V quantile the positive LFI[10]. The diagonal of the matrix reveals the probabilities not

[9] See studies on Herfindahl index evolution by Becuwe et al. (2013) for France and Charles (2013) for Switzerland.

[10] For a statistical summarize of quartile, please refer to appendix 2.

to change quantile over the period. Considering the diagonal for France and Switzerland, it appears that the probability not to change quartile is strong for both France and Switzerland on the two sub-periods we considered. For France, this probability is even higher for the products with a very positive value of LFI (comparative advantage) or a very negative value of LFI (probability of 0.73 and 0.69 for the period 1885 to 1905; 0.94 and 0.74 for the period 1906 to 1913). Same conclusion arises in Switzerland with probabilities of 0.60 and 0.73 for the 1885 to 1905 period (0.82 and 0.81 for the period 1906 to 1913).

Broadly speaking, the analysis of the transition probabilities matrices shows that the structure of comparative advantages in France and Switzerland is very few mobile and in particular at both ends of the distribution. It means that if the country has a high comparative advantage (or disadvantage) in the production of a good, it will probably keep it all the period long. This shows the importance of initial choice of specialization for both economies.

In this way, France and Switzerland seem to be very similar when analyzing the diagonal of the matrices, but differences appears when we look at the other probabilities. Over the period 1885 to 1905, the cumulative probability to transit from a negative LFI to a positive one represents 18.9% in France and 22.9% in Switzerland. Likewise, the cumulative probability to transit from a positive to a negative sign is 8.3% in France and 21.13% in Switzerland. Concerning the period 1906 to 1913, observation of a higher mobility in Switzerland is reinforced as the cumulative probability to transit from a negative to a positive sign is 14.1% in Switzerland (0% in France) and cumulative probability to transit from a positive to a negative sign is 10.29% (5.26% in France).

We can confirm this higher mobility of the Swiss economy compared to the French calculating two indexes of mobility (Shorrocks, 1978). First index, called M1, has been calculated using the trace of the matrix (tr.). Second index, called M2, is based on the evaluation of the determinant of the matrix (det.) Table 6 presents the results of both indexes in France and Switzerland.

Table 6: Indexes of mobility from the transition matrices[11]

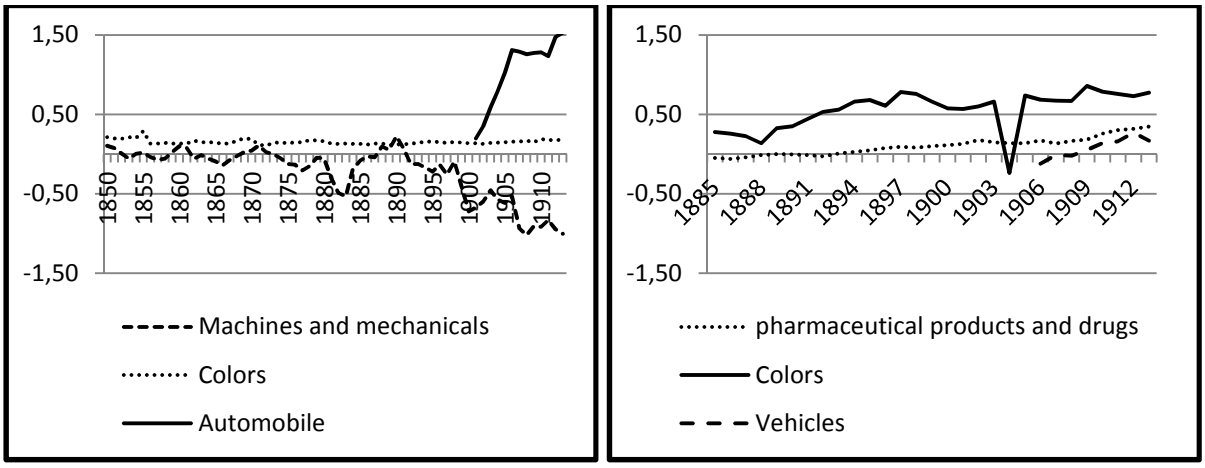
	M1	M2
1885-1905		
France	0.471	0.933
Suisse	0.549	0.977
1906-1913		
France	0.352	0.882
Suisse	0.362	0.863

[11] $M1 = \frac{m - tr[P]}{m-1}$; $M2 = 1 - |\det(P)|$

As we can see from these indexes of mobility, the mobility of the structure of specialization is higher in Switzerland than in France for both indexes and both periods.

To complete the analysis of the dynamic of French and Swiss specializations, and in order to valid our assumption of the emergence of new specializations in Switzerland, figure 2 shows the evolution of the LFI index in France and Switzerland for three "modern" specializations.

Figure 2: Evolution of the LFI index for three « modern » specializations in France (left side) and in Switzerland (right side)



Sources : « Tableau du commerce de la France avec ses colonies » et « Statistique du commerce de la Suisse avec l'étranger ». Own calculation.

This figure shows that Switzerland seems to have the willingness to develop new specializations corresponding to the latest scientific progress and technologies of the 19th century. This willingness can constitute a second explanation to the differences of economic performance between France and Switzerland. Indeed, it shows the ability of the Swiss economy to develop comparative advantages in modern specializations, with a high positive influence on the rest of the economy. To the contrary, with the exception of automobile, France seems not to develop these 'modern' specializations, making its specialization structure less and less modern and adapt to the world demand. This echoes the study of Charles (2013) that shows that Switzerland based its commercial strategy on few traditional products as well as the emergence of new dynamic and modern specializations.

Conclusion

Despite significant differences in terms of economic environment that certainly lead France and Switzerland to some natural evolutions, this article highlights common trends in terms of the type, the nature and the dynamic of exports' specializations. We underline the importance of intra-industry trade in both economies as well as a trend towards diversification. Regarding our results, the assumption of an implement of different commercial strategies in France and Switzerland (considering the almost opposite characteristics) in all the three aspects of specialization does not fit with the empirical analysis. Nevertheless, if both economies seem similar, our two databases allow going into the products' details in order to understand why France and Switzerland experienced different economic performances during the nineteenth century. On this point, our analysis allows to highlight two possible explanations. First, Switzerland unlike France has taken advantage of its workforce characteristics turning its specialization to high-value added products, sold to developed countries. Then, Switzerland sets up an economic policy dedicated to the nation's success encouraging changes in the specialization pattern and the emergence of 'new' products from scientific and technological research that will be important all the nineteenth century long and during the twentieth century. Both aspects of the Swiss strategy can be a part of the explanation of differences between France and Switzerland in terms of economic and external trade performances.

Considering these results, it seems that strategies adopted in France and Switzerland are more the result of political choices than external characteristics (country size, geography…). The economic success of a country seems not to be only the results of purely economical elements, as it appears that political, institutional or historical elements are also important. Further researches should invest the political field in the broader sense (i.e. including economic policy) in order to understand the implementation of economic strategies, and in particular the influence of the debate on protectionism on both countries economic performances.

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Appendix 1: Product categories classification in Switzerland

1885-1905

17 categories classification	35 categories classification
1. Waste and Fertilizer	1. Waste and Fertilizer
2. Chemical species	
	2.1 Pharmaceutical objects and drugs
	2.2 Chemical species for a technical use
	2.3 Colors
3. Glass	3. Glass
4. Wood	4. Wood
5. Agricultural products	5. Agricultural products
6. Leather	6. Leather
7. Objects of literature, sciences and arts	7. Objects of literature, sciences and arts
8. Mechanical objects	
	8.1 Clocks and Watchs
	8.2 Machines et vehicles
9. Metal	
	9.1.1 Aluminium
	9.1 Lead
	9.2 Iron
	9.3 Copper
	9.4 Nickel
	9.5 Zinc
	9.6 Tin
	9.7 Precious metals
	9.8 Ores and miscellaneous metals
10. Mineral matters	10. Mineral matter
11. Food products, Drinks, Tobacco	11. Food products, Drinks, Tobacco
12. Oil and Fat	12. Oil and Fat
13. Papers	13. Papers
14. Textile materials	
	14.1 Cotton
	14.2 Flax, Hemp, Jute, etc.
	14.3 Silk
	14.4 Wool, pure or blended
	14.5 rubber and gutta-percha
	14.6 Straw, Rush, Phloem, etc.
	14.7 Clothing and fashion
15. Animals and Animal matters	
	15.1 Animals
	15.2 Animal matters
16. Pottery	16. Pottery
17. Miscellaneous items	17. Miscellaneous items

1906-1913

15 categories classification	49 categories classification	54 categories classification
1. Food products, Drinks, Tobacco		
	1.1 Cereals, Corn, Rice and Leguminous vegetables	
	1.2 Fruits and Vegetables	
	1.3 Colonial goods and similar products	
	1.4 Food products of animal origin	
	1.5 Miscellaneous food product	
	1.6 Tobacco	
	1.7 Drinks	
		1.7.1 Drinks (quintals)
		1.7.2 Drinks (hectoliters)
2. Animals, matters, fertilizers and wastes from animal origin (manure)		
	2.1 Animals	
	2.2 Animal matters and similar miscellaneous products	
	2.3 Fertilizer and waste from animal origin (manure)	
3. Leather and skins, raw or treated, Leather works, Shoes	3. Leather and skins, raw or treated, Leather works, Shoes	3. Leather and skins, raw or treated, Leather works, Shoes
4. Seeds, plants, vegetable to feed livestock, Vegetable waste	4. Seeds, plants, vegetable to feed livestock, Vegetable waste	4. Seeds, plants, vegetable to feed livestock, Vegetable waste
5. Wood	5. Wood	5. Wood
6. Papers, Books and cardboards		
	6.1 Raw materials for paper making	
	6.2 Papers and Carboards, unprinted	
		6.2.1 Papers and Carboards, unprinted, with no handworks
		6.2.2 Papers and Carboards, unprinted, with handworks
	6. Papers and Carboards printed	
	6.4 Books, Journal, Engraving	
	6.5 Bookbinder works and cardboards	
7. Textile materials		
	7.1 Cotton	
	7.2 Flax, Hemp, Jute, etc.	
	7.3 Silk	
	7.4 Wool	
	7.5 Miscellaneous hairs (Animal and Human)	

	7.6 Straw, Rush, Phloem, etc.	
	7.7 Rubber and gutta-percha	
	7.8 Clothing	
8. Mineral matters	8. Mineral matters	
9. Clay, Sandstone, Pottery		
	9.1 Clay	
	9.2 Sandstone	
	9.3 Pottery	
10. Glass	10. Glass	
11. Ores and metals		
	11.1 Iron	
	11.2 Copper	
	11.3 Lead	
	11.4 Zinc	
	11.5 Tin	
	11.6 Nickel	
	11.7 Aluminium	
	11.8 Precious metals	
		11.8.1 Precious metals (coins)
		11.8.2 Precious metals (except coins)
	11.9 Miscellaneous ores and metals	
12. Machines et vehicles		
	12.1 Machines and mechanical devices	
	12.2 Vehicles	
13. Clocks, Watches, Instruments and Devices		
	13.1 Clocks and Watches	
		13.1.1 Clocks and Watches (pieces)
		13.1.2 Clocks and Watches (quintals)
	13.2 Instruments and Devices	
14. Chemical species		
	14.1 Pharmaceutical objects and drugs, perfumery	
	14.2 Chemical subtances and products for industrial use	
	14.3 Colors	
	14.4 Fats, Oils and wax for industrial use, mineral oil, tar oils and resinous oil, soap	
15. Miscellaneous items	15. Miscellaneous items	15. Miscellaneous items

Appendix 2: Statistical summary of quantiles

In order to estimate transition probabilities for France and Switzerland, we have proceeded in two steps. First, we suppress products with a LFI equal to zero. Second, we have divided our data sample into quantiles. Following tables gives a statistical summary of each quantile.

Tableau A : Descriptive statistics for quantiles (France)

	Observations	Mean	Standard Deviation	Minimum	Maximum
1885-1905					
Quantile I	32	-1.42	0.91	-4.62	-0.43
Quantile II	31	-0.27	0.09	-0.41	-0.14
Quantile III	31	-0.03	0.09	-0.14	0.13
Quantile IV	31	0.27	0.10	0.13	0.46
Quantile V	31	1.36	0.89	0.47	4.45
1903-1913					
Quantile I	36	-1.37	1.12	-4.73	-0.38
Quantile II	36	-0.23	0.06	-0.35	-0.14
Quantile III	35	0.04	0.10	-0.13	0.17
Quantile IV	36	0.28	0.07	0.17	0.44
Quantile V	35	1.39	0.90	0.46	3.82

Tableau B : Descriptive statistics for quantiles (Suisse)

	Observations	Mean	Standard Deviation	Minimum	Maximum
1885-1905					
Quantile I	145	-0.282	0.492	-3.740	-0.051
Quantile II	145	-0.030	0.011	-0.051	-0.015
Quantile III	145	-0.008	0.003	-0.015	-0.003
Quantile IV	145	-0.001	0.001	-0.003	0.002
Quantile V	144	0.283	0.739	0.002	4.518
1903-1913					
Quantile I	501	-0.137	0.278	-3.170	-0.020
Quantile II	500	-0.011	0.004	-0.020	-0.005
Quantile III	501	-0.003	0.001	-0.005	-0.001
Quantile IV	500	0.000	0.000	-0.001	0.000
Quantile V	500	0.151	0.494	0.000	5.342

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