1935 SANCTIONS AGAINST ITALY: WOULD COAL AND CRUDE OIL HAVE MADE A DIFFERENCE?[1]

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ABSTRACT

This article assesses the hypothesis that in 1935 - 1936 the implementation of sanctions on the export of coal and oil products to Italy by the League of Nations would have forced Italy to abandon her imperialistic war against Ethiopia. In particular, the article focuses on the claim that Britain and France, the League's leaders, could have halted the Italian invasion of Ethiopia by means of coal and oil sanctions, and without the help of the United States, or recourse to stronger means such as a military blockade. An analysis of the data on coal consumption in the industrial census of 1937 - 1938 shows that the Italian industry would have survived a League embargo on coal, provided that Germany continued her supply to Italy. The counterfactual proves that the effect of an oil embargo was entirely dependent on the attitude of the United States towards the League's action. Given that this attitude was by no means clear, a solitary attempt at such an embargo by the League would have failed.

ABBREVIATIONS

ASBI - Archivio Storico della Banca d'Italia (Rome).
ACS, PCM - Archivio Centrale dello Stato - Presidenza Consiglio dei Ministri (Rome).
ISTAT - Istituto Centrale di Statistica (Rome).
ISTAT(L) - Istituto Centrale di Statistica. Library (Rome).
t. - metric tonnes
m. t. - millions of metric tonnes.

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1. Introduction

In 1935 the League of Nations imposed sanctions on Italy in order to make her discontinue her aggression towards Ethiopia. The aim of this work is to assess how effective the additional implementation of an oil and coal embargo against Italy might have been in checking her bellicose policy.

The Italo-Abyssinian crisis was the first test of the effectiveness of multilateral economic action in preventing the outbreak of international military confrontations, and in punishing aggression. The failure of the sanctions can be numbered among the factors that accelerated the deterioration of international relationships which eventually led to the Second World War. The general dissatisfaction and disillusionment with international co-operation that followed the League's fiasco against Italy resulted in the political death of the League itself as an effective channel for peace-keeping.

The failure of the League was largely due to the ambiguous policy followed by the two main powers within the League: Britain and France. The Italian invasion of Ethiopia, in open defiance of the League of Nations' covenant, forced upon France and Britain a difficult choice between supporting the League and alienating Italy; or allowing the League to be flouted and depriving it of any future role in international politics in order to maintain Italian friendship. Until then both Italy and the League of Nations had constituted important factors in France and Britain's policy of containment and intimidation of Nazi Germany: the League was a body potentially capable of imposing collective punishment on future German attempts to use force against her neighbours; and Italy was a significant opponent of Nazi expansionist plans over Austria and the Balkans. French and British diplomatic services failed to realise that they were facing a dilemma which only allowed them to chose which of these two instruments of international policy they had to sacrifice. They attempted to compromise in the effort to preserve both. This led to the worst of all possible outcomes: the League destroyed, and Italy on Germany's side.

Moreover, had the sanctions succeeded against Italy, the League might have managed to send a signal to Hitler that aggression on his part would lead to severe penalties. The implications for world history could have been profound. Yet, it was and remains contentious that the economic sanctions could have ever

worked. In view of the global importance of the League fiasco, it is important to understand the cause of the sanctions' failure.

This paper focuses on the claim that sanctions failed because they did not include an embargo on strategic materials necessary to sustain the invasion of Ethiopia. Such materials as oil, coal, pig iron, and steel, in which Italy was extremely deficient, were considered necessary to win a modern mechanised war by the proponents of an embargo on strategic materials. According to this view, the mobility of the Italian army would have been drastically reduced in the absence of these raw materials, the industrial system would have encountered serious difficulties in providing the army with the means to continue the invasion, and the Italian gold reserve would have been depleted, even more: all of these factors eventually forcing Italy to back down.

Contrary to this view, this paper concludes that had the League sanctions been extended to coal (peat and coke excluded), and on crude oil (derivatives excluded) they would not have determined a different outcome. Only the active participation of the United States in the crude oil sanctions could have forced fascist Italy to abandon her imperialistic plans. The author of this paper believes that it was within France and Britain’s power (had they wanted it) to convince the United States to join in the League’s effort. Yet, this remains a personal opinion open to debate and further research. Further research is also necessary to assess systematically the outcome of an extension of the League embargo to pig iron, steel, oil derivatives, and coke.

Section 1 briefly summarises the history of the sanctions as they were implemented. Then the somehow contradictory conclusions that have been traditionally drawn from this historical example of economic warfare are discussed. Section 2 defines the counterfactual of League sanctions including coal and crude oil and lasting from November 1935 to June 1936. Section 3 assesses the possible effect of a coal embargo (coke and peat excluded) as defined in the counterfactual, on the basis of the industrial consumption by sector as recorded in the industrial census of 1937 - 1938. The data on industrial consumption are confronted with the annual data on domestic production of coal, with those on monthly coal import from Germany, and archival data on the stocks of coal held by the State railways. The section concludes that in the period at issue Italy was capable of resisting the proposed coal embargo. Section 4 briefly discusses the data on oil and oil derivative usage by industrial sector contained in the industrial census of 1937 - 1938. An econometric model of the monthly demand schedule of crude oil based on a production technology characterised by non-constant return to scale and semi-fixed input factors is estimated in section 5 to analyse the possible effect on Italy of a League embargo on crude oil. The conclusion is that the result

of such an embargo would have been totally dependent on precisely what definition of “normal peace-time supply” the administration of the United States chose to adopt.

2. Sanctions Against Italy: History and Views

The sanctions only lasted from November 1935 to June 1936. They consisted of: Proposal I which imposed a ban on arms trade to both Italy and Ethiopia; Proposal II which "asked States to render impossible all loans to or for the Italian Government, or banking or other credits to or for that Government or any public authority, person or corporation in Italian territory, and all issues of shares or other capital flotations in Italian territory or elsewhere, made directly or indirectly for the Italian Government or for public authorities, persons or corporations established in Italian territory";[2] Proposal III "related to the prohibition of importation into the territory of State Members of all goods (other than gold or silver bullion and coin) consigned from Italy or Italian possessions";[3] Proposal IV which "prohibit[ed] the exportation or re-exportation to Italy and her colonies of a certain number of articles...necessary for the prosecution of war, ...[and] mainly exported by States Members of the League".[4] In addition, a suspension of all the bilateral *clearing agreements* with Italy was declared. The sanctions came into force on 18 November 1935.

A further Proposal No. 4A, adding coal, oil, pig iron, and steel to embargoed exports, was discussed by the League on 2 November 1935. The decision was deferred to a later discussion, which took place in January 1936, at which Proposal 4A was finally abandoned on the grounds of its probable ineffectiveness. A new proposal to implement oil sanctions was made on 2 March 1936 by the British Foreign Secretary, Anthony Eden, which was blocked by fierce opposition inside the British and the French cabinets.

The sanctions had minimal, or no impact on the Abyssinian war, despite almost complete adherence to them by all members of the League. With an army of over half a million soldiers and large quantities of war *matériel*, the fascist general De Bono entered Ethiopia from Eritrea and took Adowa in October 1935 (both soldiers and *matériel* having been transported to East African territories from January 1935). After a static phase in the military operations, culminating in the replacement of De Bono with the Army officer Marshall Badoglio, the Italians defeated and disbanded three large Ethiopian armies (in the Tigre region)

[2] League of Nations, *The League from year to year (1935)*, p. 80.
[3] *Ibid.*, p. 80.
[4] *Ibid.*, pp. 80 - 81.

which comprised some 150,000 men. The second line of the poorly equipped Ethiopian army was defeated at Maychew by the end of March. The guerrilla strategy then adopted by the Ethiopians only helped to slow down the invasion. On 2 May 1936 the Emperor of Ethiopia, Haile Selassie I, left Addis Ababa for Djibouti. Three days later the Italian Army entered the capital. On 4 July 1936 the League decided to end sanctions. Britain recognised the Italian annexation of Ethiopia in April 1938[5].

Various conclusions have traditionally been drawn from the failure of sanctions in the Italo-Ethiopian episode. They are somewhat contradictory. On one hand, the ultimate failure has been used as a paradigmatic example of the general ineffectiveness of economic sanctions. On the other hand, the failure has been explained by the absence of trade sanctions on 'strategic' commodities - oil, coal and steel - with the implication that the sanctions could, perhaps, have been effective if these commodities had been embargoed. This second view is implicitly supported by the commonly-expressed opinion that the sanctions were, in fact, "a face-saving exercise in half-hearted punishment" and that they were never fully intended by the League to be seriously effective.[6] Daoudi and Dajani, for example, held that:

> The one sanction that could have been most effective, had it been implemented properly, was the oil sanction. Oil was an absolute necessity to the Italian war machine; deprived of their oil supplies the Italian army would have had no choice but to retreat.[7]

The above statement restates almost *verbatim* Walters' remark in 1952:

> In Ethiopia the Italians were fighting with planes, tanks and mechanical transports against levies that moved on foot and were armed only with rifles and machine-guns. Deprived of their oil supply the Italians would have had no choice but to retreat.[8]

This opinion seems to be confirmed by Mussolini's remark to Hitler in 1938, reported in the memoirs of the personal interpreter of the German dictator,

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[5] During the offensive the Italians committed various atrocities. For instance they made extensive use of poison-gas air bombing.

For a comprehensive history of the Italian aggression against Ethiopia see the extraordinarily well-documented work in two volumes by Del Boca, *Gli italiani.*

[6] See for example: Doxey, *Economic*, p. 93. Also: Hufbauer, Schott, and Elliott, *Economic sanctions reconsidered. Supplemental*, pp. 33 - 40.

[7] Daoudi, and Dajani, *Economic*, p. 63.

[8] Walters, *A history*, pp. 667 - 668.

according to which, faced with mineral sanctions, Italy would have had to retreat from Ethiopia "within a week".[9]

The defeat of the League's embargo shocked the international public. It left a deep mistrust in international diplomacy, and in the effectiveness of multilateral economic sanctions. This mistrust and disillusion was mirrored in the theoretical works on economic warfare, and endured for many decades. As already mentioned, the Italian case became the archetypal example of the inefficacy of sanctions. This sometimes led to misrepresentations of the historical facts. As, for example, Kindleberger:

> Most sanctions are not effective. When the League of Nations applied oil [*sic*] sanctions to Italy in 1936 because of its aggression against Abyssinia, the Department of State asked United States corporations to comply, but it could not require them to do so. The larger companies, whose operations were visible to the world stopped sending oil to Italy. This raised the price of oil in Italy and in Italian Somaliland to such a height that the business became attractive. A large number of small companies hired tankers, bought gasoline, delivered it to the Italian armies, and made sizeable profits.[10]

The false assumption that *there was an oil embargo*, coupled with the absence of references to the sources on price variations and oil company behaviour, undermines the description of the free-rider mechanism, and give a strong sense of a prejudicial opinion on Kindleberger's part.

That said, Kindleberger was certainly right when he noticed that the considerable increase in oil prices on the Italian market would have created a strong incentive for oil companies to defy an hypothetical embargo. The mere expectation of an embargo on oil produced a marked increase in the price of oil and oil derivatives on the Italian market which is clearly documented by the Italian statistics. The ISTAT cumulative gross price index (1928 = 100) for 17 oil produces shows a definite upward trend from July 1935. The increase over the next five months was above 50 per cent, from 85.1 in June to 120.3 in November 1935.[11]

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[9] Schmidt, P., *Hitler's*, p. 60; previously quoted in: Doxey, *Economic*, p. 57.

[10] Kindleberger, *Power*, p. 97.

[11] Italy, Istituto Centrale di Statistica, *Bollettino mensile, Prezzi* Tav. XXXVII *Numero indice nazionale dei prezzi all'ingrosso (base 1928 = 100), Combustibili ed oli minerali, in complesso (17 merci)*, various years; and: Italy. Istituto Centrale di Statistica, *Bollettino dei Prezzi, Prezzi* Tav. XXXVII *Numero indice nazionale dei prezzi all'ingrosso (base*

It is therefore possible that the testimony of the then Trade Minister Felice Guarneri about the position of the oil companies was over-optimistic in regard to the payment conditions:

> *Contemporaneamente, tutte le grandi compagnie petrolifere presenti in Italia, ... ci davano assicurazioni formali che avrebbero continuato a rifornirci di oli minerali e carburanti alle normali condizioni di pagamento, anche nella ipotesi che la Società delle Nazioni avesse deciso ... di applicare l'«embargo» sui detti prodotti in destinazione dell'Italia e delle sue colonie.*
>
> (Meanwhile, all the large oil companies operating in Italy, ... gave us formal reassurances that they would have maintained deliveries of mineral oils and motor fuel, with the normal payment conditions, even if the League of Nations had decided .... to apply the 'embargo' on the export of these products to Italy and her colonies).[12]

Yet, one would expect the increase in oil price to be short lived. As soon as more U.S. oil companies are attracted by the price premium on sales to Italy the premium would automatically disappear. The process would have ended as soon as the substitution of the League countries' oil companies with U.S. oil companies was completed.

Even the fact that the ISTAT oil price index remained at around 120 - 130 from November 1935 to July 1936 is probably to do with the Italian government decision to establish a State monopoly on the import and distribution of oil products taken in October 1935, and the following decision to maintain high oil prices on the domestic market to reduce oil consumption and therefore gold outlays, and trade dependency.[13]

1928 = 100), Combustibili ed oli minerali, in complesso (17 merci), various years. The movement of the index in those years was as follows: Jun. 1934 = 80.0; Jul. = 80.6; Aug. = 80.6; Sep. = 81.4; Oct. = 81.6; Nov. = 81.3; Dec. = 81.6; Jan. 1935 = 81.7; Feb. = 82.0; Mar. = 83.9; Apr. = 84.2; May = 84.0; Jun. = 85.1; Jul. = 89.6; Aug. = 93.1; Sep. = 102.8; Oct. = 107.9; Nov. = 120.3; Dec. = 122.6; Jan. 1936 = 124.4; Feb. = 127.2; Mar. = 128.1; Apr. = 127.3; May = 127.1; Jun. = 128.0; Jul. = 121.3; Aug. = 113.7; Sep. = ; 104.9; Oct. = 100.9; Nov. = 100.7; Dec. = 107.0.

[12] Guarneri, *Battaglie*, pp. 497 - 498.

[13] Royal decree: R.D.L. 24 October 1935, No. 1880. See also Guarneri, *Battaglie*, p. 511. The tax on the sale of oil produces was increased substantially by the Royal decrees: R.D.L. 17 October 1935, No. 1963; and R.D.L. 31 October 1935, No. 1857. Later, the tax was reduced considerably by the Royal Decree: R.D.L. 18 July 1936, No. 1361.

3. Setting the Counterfactual

A discussion of the consequences of an oil and coal embargo against Italy must begin with the conclusions of the Committee of Experts appointed by the League to conduct a technical examination of petroleum sanctions on Italy when steel, oil and coal embargoes were being considered. The Committee met from the 3 to the 12 February 1936. Its conclusions were:

> (1) A period of about three to three and a half months would have to elapse before an embargo on the export of petroleum and petroleum products, if universally applied, would become fully effective;
>
> (2) In the event of such an embargo being applied by all States Members [*sic*] of the Co-ordination Committee, it would be effective if the United States of America was to limit its exports to Italy to the normal level prior to 1935;
>
> (3) If such an embargo were applied by the Member States of the Co-ordination Committee alone, the only effect which it could have on Italy would be to render the purchase of petroleum more difficult and expensive;
>
> (4) An embargo on the export of petroleum and petroleum products would be strengthened if it were extended to cover industrial alcohol and benzol;
>
> (5) The effectiveness of an embargo on the transport of oil to Italy was subject to the same limitations as an embargo on exports.[14]

The dependence of Italy on foreign supplies of these mineral combustibles was almost total. Table 1 gives a clear picture of the Italian production and imports of coal and crude oil to satisfy the needs of the country.

First, let us outline, and then discuss, the counterfactual. Suppose that:

1) On 18 November 1935 the League's members adopted the economic sanctions against Italy, listed in Proposal III, IV, and Proposal IVA (except for steel, pig iron, and other strategic metals).[15]

2) The sanctions ended on the 4th of July 1936.

3) All the non-members of the League (except the United States and Germany) adopted the League's embargo on oil and coal.

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[14] League of Nations, *The League from year to year (1936)*, p. 53.

[15] Proposal I and II had already been implemented.

The exclusion of pig iron and steel from the counterfactual is intended to focus attention on the high economic dependency of Italy on foreign combustibles and motor fuels.

The starting date is chosen in view of the fact that ratification of Proposal IVA was discussed from the very beginning of the League's action in opposition to the Italian aggression against Ethiopia. On 9 October 1935 the British Cabinet discussed and approved in principle the application of oil sanctions. Moreover, the issue of a strategic materials embargo was clearly included in the diplomatic discussions held in Geneva in the same month. This means that the inclusion of oil and coal in the list of merchandise banned on 18 November is plausible. The members of the League were quite fast in passing national legislation to accomplish the League Co-ordination Committee's decisions of 19 October and 2 November, so there is no reason to believe that, if they had so directed, the same could not have been done for oil and coal.[16]

Table 1. Italian production and imports of coal and crude oil, 1934 - 1936

Year	*Coal (coke excluded)*			*Crude oil*		
	Italian production ***t.***	*Italian import* ***t.*** *(a)*	*Total*	*Italian product. t.*	*Italian import* ***t.***	*Total*
1934	782,958 (*6.2%*)	11,781,384 (*93.8%*)	12,564,342 *(100%)*	20,180 (*12.4%*)	142,948 (*87.6%*)	163,128 *(100%)*
1935	989,108 (*6.8%*)	13,536,384 (*93.2%*)	14,525,492 *(100%)*	15,977 (*6.8%*)	219,991 (*93.2%*)	235,968 *(100%)*
1936	1,575,589 (*15.3%*)	8,720,158 (*84.7%*)	10,295,747 *(100%)*	16,106 (*5.1%*)	300,838 (*94.9%*)	316,944 *(100%)*

(a) Includes peat. Nevertheless, the incidence of peat on the figure is very limited. In 1934, 1935, and 1936 peat imports totalled respectively: 517 ***t.*** (source: Italy. Ministero delle Finanze, *Statistica*, 1934 XII, p. 44); 146 ***t.*** (Italy. Istituto Centrale di Statistica, *Statistica*, 1935 XII, p. 44); and 3,423 ***t.*** (*Ibid.*, 1936 XII *Bozze di stampa riservate*, p. 92).

For the production levels the source is: Rey, *I conti*, p. 126, Tav. 2.02 *Totale carboni fossili (esclusa torba)*;[17] and Tav. 2.02 *Petrolio greggio*.

For the import levels the sources are: Italy. Ministero delle Finanze, *Statistica*, various years; and: Italy. Istituto Centrale di Statistica, *Statistica*, various years, *No. 1515 Carbon fossile ed altri combustibili fossili naturali o carbonizzati, escluso il coke*, and *No. 1724 Oli minerali greggi*.[18]

[16] See for example: Doxley, *Economic*, pp. 51; League of Nations, *The League from year to year (1935)*, pp. 53 - 88; and Renwick, *Economic*, p. 12.

[17] It excludes both peat and coke. The latter is reported separately in Tav. 2.10 *Produzione delle industrie dei derivati del carbone e del petrolio* at p. 141 as *coke metallurgico*. The exclusion of coke from the domestic production data reproduced above can also be inferred from the fact that almost every year domestic coke production exceeds that of *totale carboni fossili* (coal).

The end point of the counterfactual is the historical conclusion-date of the sanctions (June 1936). The cessation of the sanctions was dictated on the one hand by the defeat of the Ethiopian armies and the occupation of Addis Ababa in May; and on the other hand, by the deterioration of the situation in Europe with Hitler's denouncement of the Locarno Treaty and occupation of the Rhineland on 7 March 1936. Retaining the June 1936 upper frontier to sanctions in the counterfactual means ruling out the possibility that the strengthened economic warfare of the League could change the course of military events in Abyssinia. This judgement is based on the enormous difference in military preparation and *materiél* availability of the two sides involved in the conflict. Today, it is generally acknowledged that the size of the Italian army and of the *materiél* stocks at its disposal at the beginning of the boycott were sufficient to win the war whatever non-military action was undertaken by the international community (excluding, probably, the closure of the Suez straits). The Committee of Experts, estimated that Italy had stocks of oil and oil derivatives for at least 700,000 - 800,000 ***t.*** by December 1935, and that the consumption in the theatre of war was 20,000 - 30,000 ***t.*** per month. Manifestly, the needs of the Italian war machine were guaranteed by the existing stocks assuming that military operation exercised a priority over industrial production.[19]

The inclusion of coal and petroleum among the embargoed commodities means that the counterfactual differs from reality in one other aspect: graduality. This was one of the founding pillars of the theory of economic embargoes officially followed by the major powers in the thirties. This theory regarded graduality as a way to force the target country to 're-think' her aggressive policy. It was also assumed that there was no need to engage in a total economic war if the same result could be achieved through a limited commercial and financial embargo. This tactic was intended to spare the sanctioning countries unnecessary economic hardship. Moreover the Italo-Ethiopian conflict was expected to

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[18] On the statistical problem concerning the data on the import of crude oil, it is worth quoting the Committee of Experts (League of Nations, 'Dispute', p. 6):

> The Italian import statistics record the entry of goods into Italy when they pass the Custom frontier. As considerable quantities of petroleum and its derivatives are purchased by Italy for use as bunkers in Italian ports, for the requirements of the navy, for refining in the free ports of Fiume and Trieste and, from time to time, for storage in tanks outside the Custom area, the import figures, especially for crude petroleum and fuel oil, do not account for the whole of Italian requirements.

[19] On the material preparation of the Italian army see: Del Boca, *Gli italiani*, *passim.*

On the Italian oil stocks and war consumption: League of Nations, 'Dispute', p. 3, and pp. 7 - 8.

continue for more than one year. This meant that if a limited embargo did not work there was always time to consider more stringent sanctions.[20]

Today, sanction theory holds exactly the opposite view. Multilateral sanctions must be intended to do the maximum damage to the target from the very beginning. They must be sudden, with no temporal lag from decision to implementation. In this way the target country is left with no time to undertake stock-piling policies to undermine the efficacy of the multilateral sanctions in the initial period of their implementation. The first months are crucial because the target's capacity to find alternative sources of the embargoed materials and to circumvent trade controls increases with time, easing the sanction strain. Likewise, the temptation for each sender country to act as a free-rider and break the boycott increases with time. As Frey puts it: 'A progressive application of sanctions may be less effective because it allows more time for the target economy to adapt'.[21] Moreover:

> There is usually a considerable time distance between the decision to undertake sanctions and their legal and administrative implementation. This allows the boycotted country, and also those groups within the boycotting country expecting to lose from the policy, to organise counter-measures and to exploit fully the possibilities offered by flexible production and consumption patterns.[22]

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[20] Robertson states another explanation for limited economic sanctions (Robertson, *Mussolini*, pp. 172 - 173):

> Behind the scenes Hoare and Eden met Laval and discussed means for putting the mechanism of collective security into operation in such a way as not to jeopardise peace..... Hoare wished at all costs to avoid armed confrontation with Italy, and he was backed by the British High Command. Not surprisingly, Hoare and Laval agreed to work for a negotiated settlement. Only limited economic sanctions, imposed 'cautiously and in stages', could be considered. The risk of war was so great that military sanctions, such as the blockade of Italy and closure of the Suez Canal to her shipping (which alone, according to the Admiralty, would bring Italy to her knees) were absolutely ruled out. Hoare and Laval not only sought to avoid the risk of war: they both admired Mussolini and frequently expressed the fear that his downfall would lead to chaos and the victory of Communism in Italy.

On the policy of "graduated pressure" see also: Doxley, *Economic*, p. 58. On the widely held forecast of a long duration conflict see: Rowan-Robinson, *England*, pp. 135 - 136, and Del Boca, *Gli italiani*, pp. 377.

[21] Frey, *International*, p. 105.

On this point in the Italian case see: Guarneri, *Battaglie*, *passim*; and Renwick, *Economic*, *passim*.

[22] Frey, *International*, p. 115;

The fact that the short-run effects of an embargo are of paramount importance in order to exert political pressure on the target country proceeds also from Hirschman's consideration:

> The immediate loss from the stoppage of trade is much greater than the ultimate loss after resources have been fully reallocated. The classical theory of international trade was aware of this distinction; but it concentrated upon the ultimate loss and considered the time elapsing from interruption of trade to reallocation of resources within the country as short-run period. Modern theory insists that is not necessarily true; and even if it were true, our analysis would have to take into account the fact that harassed statesmen generally have short-run view.[23]

Substitution of embargoed commodities with domestic resources is always possible but takes time. In certain cases there are limits to the extent to which alternative sources can be found within the target country even in the long-run. In the case of Italy, the possibilities of substituting foreign coal and oil with labour and other domestic resources, were particularly limited. These limits are obvious in industry, although less so in agriculture. The existence of these limitations was fully acknowledged by the fascist leadership. For example Mussolini, in his speech to the *Camera dei deputati* of the 26 May 1934, said:

> *Non facciamoci illusioni sulla autarchia. Tutte le nazioni moderne, grazie allo sviluppo prodigioso delle scienze, possono tendere ad una certa autarchia. Ma noi, fino a prova contraria, avremo bisogno di importare combustibile liquido.*
>
> (Let us not delude ourselves about autarky. All the modern nations, thanks to the prodigious development of the sciences, can move towards a partial autarky. But we, until the contrary is proven, will have to import liquid combustibles.)[24]

The restrictions on substitution of oil and coal with domestic resources are confirmed *ex-post* by the analysis of the trade of these commodities in the years after the sanctions. This was the period during which the fascist regime made the maximum effort towards autarky. While the autarkic program was partially successful in reducing the imports of machinery, foodstuffs, and some types of raw materials, it failed completely to restrict Italian imports of combustibles. On the contrary, the import of these commodities increased over the autarky period.[25]

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[23] Hirschman, *National*, pp. 26 - 27.

[24] Previously quoted in Guarneri, *Battaglie*, p. 587.

[25] See: Tattara, 'La persistenza', pp. 394 - 398.

In conclusion, in the discussion of the counterfactual on coal it is assumed that coal could not be substituted by other inputs in the short period. Yet, some form of substitution between the various qualities of coal is allowed when the reallocation of coal supply between industrial sectors is discussed. This approach is made compulsory by the broad definition of 'coal' adopted by the statistics on German imports, and by those on coal stocks. On the contrary, in the discussion of the counterfactual on crude oil the short term substitution elasticities are calculated for the Italian demand schedule.

Full agreement on the application of oil and coal sanctions by all the members of the League is needed to test the maximum capacity of the League as a body to harm the Italian economy. Such internal cohesion within the League over the application and enforcement of the extended sanctions could not have happened without a strong commitment to such a policy by the British and French governments. The cohesion of the League over oil and coal sanctions is essential in view of the possible import supplier substitution. As Frey clearly points out, to be effective, trade sanctions must be implemented by all of the target commercial partners.[26]

> The sanctions imposed have the character of a public good for the participating nations. While each participant may agree that the country in question ought to be punished economically, each has an incentive to break the rules and to supply the boycotted goods (at a high price) and buy the country's exports (at a good discount).[27]

In the same fashion, there is no point in imposing a trade embargo on a country only to see non-sanctionist countries taking over all the international trade of the target. In economic terms, where there is potential for import provider substitution it will be exploited and economic warfare will fail. Clearly the results of a counterfactual on oil and coal sanctions strictly depend on the assumptions made about the Italian capability to substitute imports from the League members with imports of the same commodities from the United States, and Germany. Italy, being a small economy (at least in comparison with the United States), could have arranged import supplier substitution without encountering particular

[26] There were League members like Albania, Austria, Chile, Hungary, Paraguay, Salvador, Switzerland, and Venezuela that for various reasons opposed sanctions against Italy. It is assumed here that had League leaders (France and Britain) been more decided in backing the League action against Italy, it would have been impossible for these countries not to adhere to the League sanctions policy.

[27] Frey, *International*, p. 106.

bottlenecks on the supply side. In this article the effects of an hypothetical embargo on coal and crude oil are analysed under the provisions that:

1) Germany could not or would not expand her coal supply to Italy above the level historically reached in the period November 1935 - June 1936;
2) the United States would have stick to their commitment not to expand their supply to Italy above 'peace-time' levels.

These assumptions are introduced to ascertain the effect of the hypothetical sanctions in the most effective possible scenario for the League's action.

4. Coal Dependency: Sectoral and Aggregate Analysis

The analysis of the hypothetical effect of the proposed embargo on oil and coal on the Italian industries depends on the assumptions made about the characteristics of the production process. In this section we will assume the industrial production to be characterised by having a fixed input-coefficients technology. The construction of a complete input-output matrix is here impeded by the lack of appropriate statistical data. The quantitative sources for the period 1935 - 1936 are fragmentary, as a result of the embargo on official statistics adopted by the fascist Cabinet in retaliation against the League's sanctions. Data on the consumption of fuels by the Italian industrial sectors was published in the industrial census of 1937 - 1939. Despite referring to a later period, this data gives a picture of the industrial sectors' energy requirements that is probably very close to the situation in 1935 - 1936. Moreover, in respect to combustibles consumption, it is safe to assume that the eventual technical change undergone by the Italian industry during and in the aftermath of the League's sanctions, would have led to a reduction of consumption of these materials. Efforts in this direction were recorded by Guarneri in his memoirs.[28]

The information derived from the industrial census of 1937 does not enable us to build a full input-output table for the Italian economy. Firstly, it concerns only the industrial sector, thus leaving aside agriculture, and the bulk of services. Secondly, while most of the census refers to the year 1937, the data relative to the engineering sector pertains to the year 1938. Thirdly, data on the usage by industrial sector of inputs has been collected only for a limited number of commodities and services; namely: labour, and combustibles. On the contrary, input-output analysis requires data on the usage of the output of every "activity" as

[28] Guarneri, *Battaglie*, pp. 559 - 560.

an input in the other "activities". On the basis of the 1937 - 1938 census, it is possible to disaggregate the Italian industrial system into 19 sectors.[29]

Table 2. Coal consumption by industry, Industrial census 1937 - 1938

Sector	*(a) Coal (peat and coke excluded)* ***t.***	*(b)*
Transport, and communications	3,290,089	22.5
Glass, building materials, and non-metallic minerals *(c)*	1,737,677	11.9
Metallurgy	1,120,020	7.7
Textiles *(c)*	1,104,193	7.6
Chemicals	744,245	5.1
Foodstuffs	542,090	3.7
Electricity production and distribution	306,754	2.1
Engineering (1938)	302,441	2.1
Other industries *(c)*	186,009	1.3
Paper industry	178,591	1.2
Construction *(c)*	82,816	0.6
Mineral extraction	72,823	0.5
Water and gas distribution	25,641	0.2
Industrial services	25,206	0.2
Leather and skins *(c)*	24,975	0.2
Clothing trade and furniture *(c)*	19,583	0.1
Wood transformation *(c)*	12,107	0.1
Printing industry *(c)*	9,406	0.1
Phonographic + cinema	876	-

(a) "*Combustibili - Solidi - Antracite e litantrace*", and "*Combustibili - Solidi - Ligniti*".
(b) = *(a)* as a per cent of the 1937 total supply of coal. Where the 1937 total supply is the sum of import and domestic production of coal.

For the coal domestic production the source is: Rey *I conti*, p. 126. The domestic production was 2,024,126 ***t.*** in 1937, and 2,353,458 ***t.*** in 1938.

For the coal import the source is: Italy. Istituto Centrale di Statistica, *Bollettino*, various years. The coal import was 12,572,782 ***t.*** in 1937 and 11,914,964 ***t.*** in 1938.
(c) Data do not include craft workshops.

[29] The 1937 - 1938 industrial census allows a deeper level of disaggregation. Nevertheless, disaggregation into 19 main sector while being sufficient for our scope, also has the advantage of being synthetic.

Direct consumption by sector of coal (anthracite, bituminous and sub-bituminous coal, and lignite) in 1937, and the correspondent input-coefficients are summarised in Table 2. These figures seem to suggest that the largest industrial contributors to Italian demand for coal were “transport, and communications” "glass, building materials, and non-metallic minerals", metallurgy, textiles manufacture, and the chemical industry.[30]

If the absence of a complete input-output table does prevent us from seeing the production process as a complex intersectoral nexus, it does not prevent us from drawing conclusions about the direct effects of a combustibles embargo on each sector separately. Firstly, it is important to note that industry (transport included) used 67.2 per cent of the total supply of coal (the sum of imports and domestic production). Most of the remaining coal demand was for heating purposes. Given the mild climate of the Italian peninsula, central heating is used only during winter months; in particular from November to March. It is then possible to assume that almost the entire demand of coal for heating originated during the sanction months. Assuming, for simplicity, that industrial requirements of coal were evenly distributed throughout the year, it can be estimated that about 77.6 per cent of the annual demand of coal originated in the months from November to June (44.8 per cent from industry and 32.8 per cent from other needs - mostly heating).

Demand. One can obtain a very rough idea of the Italian demand for coal in the eight months of the sanctions by assuming that in 1935 import and domestic production minus the increase of coal stocks matched final demand. In 1935 the total supply was 14.5 ***m. t.*** as shown in Table 1 above. This figure excludes coke but includes imports of peat. Therefore, concurs to slightly overestimate coal demand.[31] From this figure one should subtract the 1.0 ***m. t.*** increase in the stocks

[30] Not being able to build a complete input-output matrix for the Italian economy in 1937, we are not able to define the total effect that a combustibles embargo could have on production, as a result of the complex sectoral inter-dependencies. The only thing that the available input-coefficients tell us is the direct effect on each industrial sector of a coal and oil shortage. They do not tell us, for example, the reduction of the output of construction that a shortage of oil could indirectly cause through the reduction in the output of metallurgy and thus the minor availability of metallurgy produce to be used by construction as an input material.

[31] See notes to Table I above. One should also note that Italian coal exports are not subtracted from the total supply figure, nor they are considered in the remainder of the paper. There are two reasons for this exclusion. The first and foremost is that Italian exports were small and mostly directed to the Italian colonies that are here considered as constituent of the sanction target. Italian export of coal (but the same is also true for crude oil and oil derivatives) were so negligible that they do not affect in any way supply and

held by the FF. SS.[32] (the State railways) which had been granted the monopoly over all the Italian coal imports by a law of July 1935.[33] Probably, 1.0 ***m. t.*** is a gross underestimate of the 1935 build up of coal stocks. The Trade Minister Guarneri noted that:

> *Sapevo che tutte le industrie possedevano scorte [di minerali, metalli, e combustibili] che, permanendo il ritmo di lavoro in corso, potevano bastare per un periodo di circa sei mesi, il quale avrebbe potuto prolungarsi, qualora si fosse fatto subito ritorno alla settimana normale di quaranta ore.*
>
> (I knew that the industrial companies had enough stocks [of metals and combustibles] for a period of ca. six months. The stocks could have lasted even longer if the working week was once again fixed at 40 hours).[34]

Yet, here we will suppose that the railway's were the only existing coal stocks in order to avoid an underestimation of demand. Therefore, the resulting figure is 13.5 ***m. t.*** It is possible that the net figure of 13.5 ***m. t.*** in 1935 was obtained via a reduction of non-industrial coal usage in the last months of the year, leading to a slight underestimate of the normal peace-time levels of the Italian demand. To provide for this possible bias, and to allow for an increase in the industrial production in 1936 (and thus for an increase in coal consumption), let us augment the 1935 figure by 5 per cent. This gives a figure of ca. 14.2 ***m. t.*** for the total annual demand. As seen above, 77.6 per cent of this figure pertains to the months of the sanctions, giving a peace-time demand for the period November 1935 - June 1936 of 11.0 ***m. t.*** Of this demand 6.36 ***m. t.*** would have been for industry, and the rest (4.66 ***m. t.***) for non-industrial consumption.

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demand figures denominated in millions of metric tonnes. The second is methodological: had coal sanctions been implemented coal export would have certainly been suspended. This is not only because there were League sanctions against Italian exports, but also because scant domestic production and import from Germany of coal could have not been spared.

[32] From: ACS, PCM, 1934 - 1936, 3/2-15, 121, "*Posizione scorte e approvvigionamenti carboni - fonte Ministero delle Comunicazioni - Ferrovie dello Stato - Servizio Approvvigionamenti - Comunicazione mensile al Capo del Governo - Carboni da vapore (in pezzi, minuti, mattonelle) disponibilità presso i depositi Combustibili e le Agenzie all'inizio del mese*".

[33] Royal decree: R.D.L. 28 July 1935, No. 1375. See also Guarneri, *Battaglie*, pp. 471 - 472, and p. 511.

[34] Guarneri, *Battaglie*, pp. 496 - 497.

Table 3. Italian import of coal from Germany (coke excluded) ***t.***, November 1935 - December 1936

Date	*Italian statistics*	*German statistics (c)*
November 1935	813,156 *(a)*	858,580
December	755,350 *(a)*	739,416
January 1936	657,983 *(b)*	649,302
February	609,496 *(b)*	589,758
March	636,002 *(b)*	463,553
April	427,479 *(b)*	461,076
May	402,215 *(b)*	479,852
June	401,989 *(b)*	665,046
Sub-total (Nov. - Jun.)	**4,703,670**	**4,906,583**
July	430,713 *(b)*	
August	420,887 *(b)*	
September	438,755 *(b)*	
October	527,628 *(b)*	
November	460,566 *(b)*	
December	503,511 *(b)*	
Sub-total 1936	**5,917,224** *(b)*	

(a) Italy. Istituto Centrale di Statistica, *Statistica*, Roma various years;
(b) Italy. Istituto Centrale di Statistica, *Statistica*, bozze di stampa, ISTAT(L).
(c) Germany. Herausgegeben vom Statistischen Reichsamt, *Monatliche*, Berlin various years (238a Steinkohlen, Anthracit, Unbearbeitete, Kännelkohlen + 238e Steinkohlenpreßkohlen + 238f Braunkohlenpreßkohlen Naß-preßoteinte).[35] .

Supply. From the Minister of Communications' statistical reports to Mussolini we know that the State railways coal stocks at the beginning of November were 2.9 ***m. t.*** more than equalling the demand for two months.[36] To

[35] There are few systematic differences in the monthly data of coal transfers between Italian and German trade statistics. These are obviously due to the transportation time.

[36] From: ACS, PCM, 1934 - 1936, 3/2-15, 121, "*Posizione scorte e approvvigionamenti carboni - fonte Ministero delle Comunicazioni - Ferrovie dello Stato - Servizio Approvvigionamenti - Comunicazione mensile al Capo del Governo - Carboni da vapore (in pezzi, minuti, mattonelle) disponibilità presso i depositi Combustibili e le Agenzie all'inizio del mese*".

As noted above, Guarneri affirmed that industries had stocks for six months. Here, the railways' stocks are prudently assumed to be the only ones existing at the time (Guarneri, *Ibid.*, pp. 496 - 497). The Italian government started a vast programme of coal stock piling at the beginning of 1934; see: ACS, PCM 1934 - 1936, b. 1896, fasc. 3/2-15, 121,

this one should add 1 ***m. t.*** secured by domestic production. The figure is obtained assuming that domestic production was equally distributed over the twelve months of the year.
Then: 1/6*(domestic production of 1935) + 1/2*(domestic production of 1936). This equals: 1/6*(989,108 ***t***.) + 1/2*(1,575,589 ***t***.) = c.a. 1 ***m. t.***[37]

According to the Italian statistics for the period from November 1935 to June 1936 one can observe that the German imports covered 4,703,670 ***t***. of the demand (first column Table 3). This figure would be even higher according to the corresponding German export data (last column of Table 3).

This gives a total supply of ca. 8.6 ***m. t.***, that leaves unmatched 2.4 ***m. t.*** (or 22 per cent of the total demand for those months). In summary, 77.6 per cent of the annual demand of coal originated in the eight sanction months; 44.8 per cent from industry and 32.8 per cent mainly from heating demand. This accounts for 11.0 ***m. t.*** of coal. In the same months, the non-embargoed supply would have been 8.6 ***m. t.*** (of which 2,902,189 ***t.*** from the railways stocks, 952,646 ***t.*** from domestic production, and 4,703,670 ***t.*** from German supply). The difference between demand and supply being ca. 2.4 ***m. t.***, equalling 22 per cent of the demand.

With fixed input-coefficients technology, a 22 per cent decrease in coal supply, if equally distributed among sectors and between industry and consumption, would bring about a 22 per cent decrease in the output of each sector. On an annual basis a 22 per cent decrease is circa a 15 per cent contraction. Clearly, this means economic collapse. Nevertheless, in a situation of supply shortages a homogeneous distribution of coal between consumption and industry is less than credible. It is important to notice that the supply calculated above (8.6 ***m. t.***) greatly exceeds the industrial necessities (6.4 ***m. t.***). This leaves 2.2 ***m. t.*** for non-industrial consumption. 2.2 ***m. t.*** is a mere 47 per cent of the demand for non-industrial consumption (4.66 ***m. t.***). It is clear that a 53 per cent reduction in non-industrial consumption is far too much to ask even for a dictatorship. Yet, it is probable that savings on a substantial scale in non-industrial consumption were achieved during the sanction episode. In fact, even in the absence of sanctions on combustibles, the total supply of coal decreased from 14,525,492 ***t***. in 1935 to 10,295,747 ***t***. in 1936, due to a considerable contraction in import from 13,536,384 ***t.*** in 1935 to 8,720,158 ***t.*** in 1936.[38]

"*Prospetto relativo alla posizione delle scorte di carbone" - "Promemoria per S.E. il Capo del Governo*"; 26 March 1934.

[37] See: Table I, above.

[38] See: Table I, above.

A 33.3 per cent contraction in non-industrial consumption is probably the maximum the regime could have obtained. This would have reduced demand for non-industrial consumption to 3.1 ***m. t.***, leaving unmatched only 0.9 million tonnes of coal. Other savings could have been obtained by reducing the output of non-strategic sectors like textiles, paper industry, construction, and "glass, building materials, and non-metallic minerals". For example, a 15 per cent reduction in the output of the textiles, and the construction industries and of the and "glass, building materials, and non-metallic minerals" sector, for eight months could have saved 0.3 ***m. t.***

In fact, there is strong evidence that the fascist regime adopted forceful measures to limit the production of large raw materials consumers like the construction sector even in the absence of a coal embargo. For example, on the 30 August 1935 Mussolini issued a directive which completely halted the construction of new buildings, and which probably brought savings far in excess of the 0.3 ***m. t.*** mentioned above via a reduction of the activity of the "glass, building materials, and non-metallic minerals" sector.[39] This is confirmed by the remarkable drop in the index of the construction industry from September 1935 to June 1936 (Figure 1) and by the significant reduction in public works financed by the State in 1935 and 1936.[40]

Moreover, this drop in the construction sector certainly accounts for a significant part of the reduction of coal import from 13.5 ***m. t.*** in 1935 to 8.7 ***m. t.*** in 1936. Even if we remove from the 1935 figure the 1.0 ***m. t.*** for stock building by the railways, the imports contraction remains in the order of 3.8 ***m. t.*** Accounting for the 0.6 ***m. t.*** increase in domestic production there is still a 3.2 ***m. t.*** reduction unexplained. In 1936 railways' stocks decreased only by 0.7 ***m. t.***[41] leaving a 2.5 ***m. t.*** reduction in imports unaccounted for. Considering that overall industrial production remained steady (and indeed some strategic sectors such as

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[39] ACS, PCM, 1934 - 1936, fasc. 9/7, n. 5014, sottofasc. 1, "*Divieto di costruzioni edilizie per limitazione importazione di materie prime*". From the papers contained in this file it appears clear that the ban was strictly enforced.

Plaster, lime, concrete, and tile furnaces glass making and ceramics combined to make the "Glass, building materials, and non-metallic minerals" sector the largest industrial coal consumer.

[40] State spending on public works declined from 2,500 million lire in 1934 to 2,170 in 1935 and 2,027 in 1936; see: Rey, *I conti*, Tav. 3.02 pp. 146 - 147.

[41] From: ACS, PCM, 1934 - 1936, 3/2-15, 121, "*Posizione scorte e approvvigionamenti carboni - fonte Ministero delle Comunicazioni - Ferrovie dello Stato - Servizio Approvvigionamenti - Comunicazione mensile al Capo del Governo - Carboni da vapore (in pezzi, minuti, mattonelle) disponibilità presso i depositi Combustibili e le Agenzie all'inizio del mese*".

metallurgy and engineering increased its activity), the unexplained 2.5 ***m. t.*** imports reduction can only be credited either to one of the following: unaccounted coal stocks; decreased non-industrial consumption; and contraction in the activity of the construction industry; or to a combination of these factors. Certainly, the reduction of activity in the construction sector (the average monthly index fell from 162.3 in 1935 to 91.9 in 1936 being 1928 = 100)[42] contributed something around 1.0 ***m. t.*** to these unaccounted savings.

Quite apart from these considerations, even if Germany had been required to provide the additional 0.9 million of tonnes of coal, this would have added a maximum of 90 million lire to the outflow of gold from Italy (assuming the excessive premium of 100 lire per ton of coal).[43]

Coal shortages might have occurred if the sanctions had been prolonged beyond June 1936. Yet, considering that:

1) in the months from July to October the demand for heating is not substantial;
2) it is likely that there were large unaccounted stocks;
3) the hypothesis of a five per cent increase in coal demand in 1936 is over-prudential (in fact a slight reduction in industrial production could have been sustained and was indeed experienced);
4) there was room for coal supply reallocation in favour of the strategic sectors;

one could safely conclude sustain that Italian needs would have been provided for until November 1936. By that time new commercial links with non-League providers and especially commercial re-routing through third parties would have developed so as to render ineffective the coal embargo even if prolonged. Moreover, six months would already have passed from the conquest of Ethiopia, rendering the continuation of the League sanctions less likely. It is important to note that all the possible biases in the following calculations go in the direction of:

(a) overestimating demand (5 per cent above the supply of 1935 - and in particular, absence of demand reduction as a result of the contraction in export and thus production in consequence of the League's sanctions on Italian exports);
(b) underestimating supply (only the State railways' stocks are accounted for covering only two month of demand).[44]

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[42] Source: : Italy. Ministero delle Corporazioni, *Sindacato*, various years.

[43] See: Figure II, below. For the average coal wholesale price (in Genova and Milano) see: Italy. Istituto Centrale di Statistica, *Annuario*, various years. The average price of coal in 1937 was 243 lire per ***t.***, and 239 lire per ***t.*** in 1938.

[44] The only exception here being the minimal overestimate of supply that is caused by the inclusion of peat among the accounted imports of coal. But see note to Table I above.

This leads us to think that Italy could have gone through coal sanctions without acquiring extra coal and with a reduction in non-industrial consumption, of less than the 33.3 per cent calculated above.

Source: : Italy. Ministero delle Corporazioni, *Sindacato*, various years.

Source: ASBI, Ragioneria, regg., medie bilancio, nn. provv. 25 e 26; and De Mattia, *I bilanci*, V. II, Tav. 19, pp. 804 - 805.[45]

[45] The value at the end of each month in the ASBI series is the one reported by De Mattia, *I Bilanci*, V. II, Tav. 19 - *Dettaglio mensile delle riserve e dei valori in cassa degli istituti di emissione dal 1845 al 1936*, **A** - *Totale delle riserve*, pp. 804 - 805. This includes the following entries reported by De Mattia: **1** - *Oro decimale*; **4** - *Oro non decimale*; **6** -

In conclusion, an embargo on coal starting in November 1935 and ending in June 1936 would have had little effect on the Italian economic condition. Certainly, it would have not affected industrial production, nor would it have substantially altered the level of gold reserves at the end of the period. The standard of living would have been lowered but probably not to a level that could have eventually forced the fascist leadership to back down.

Coal sanctions would not have altered the outcome of the war. If prolonged after the Italian military victory over the Ethiopian army, the sanctions would have started to produce results only by the end of 1936. Their long term efficacy is very doubtful. In particular it is possible that illegal import (commercial re-routing through third parties), and reductions in non-industrial consumption would have provided for the halt in supply from the League's members.

5. Oil Dependency: Evidence from the Industrial Census

The industrial census of 1937 - 1938 also included data on coke, various oil derivatives, and petrol consumption. No statistics on crude oil consumption were compiled. Yet, for goods like coke or oil derivatives, the analysis carried forward above for coal can not be repeated because of its extreme complexity due to the nature of 'industrial products' of these goods. While the short term dependency on raw materials like coal can be analysed separately from the demand and supply of other materials, the study of the dependency on intermediate goods like coke or oil derivatives must be carried on in conjunction with that on the dependency on the raw materials necessary to obtain the intermediate goods. This is determined by the fact that embargoed imports of intermediate goods can be substituted by un-embargoed imports of the same goods, or by an increase in their domestic production. The latter would produce an increase in the import of the necessary raw-materials. Moreover, the fact that intermediate goods can be manufactured domestically means that to analyse dependency an additional layer of hypothesis must be introduced on the available capacity, (i.e. how much could domestic

Verghe d'oro; **13** - *Disponibilità sull'estero (biglietti di banche estere - buoni del tesoro di stati esteri - cambiali sull'estero - crediti in c/c all'estero)*; **29** - *Oro acquistato*. The series "Reserves and liquidity" is De Mattia's "**B** - *Totale delle riserve e della cassa*". This adds to the preceding series the following entries: **3** - *Argento divisionario a corso legale (835/1000)*; **5** - *Argento non decimale*; **7** - *Rame, bronzo ed eroso misto (argento di bassa lega)*; **9** - *Monete di nichelio*; **12** - *Biglietti e buoni di cassa dello stato*; **13** - *Disponibilità sull'estero (biglietti di banche estere - buoni del tesoro di stati esteri - cambiali sull'estero - crediti in c/c all'estero)*; **21** - *Oro di proprietà*; **23** *Biglietti e titoli di altri istituti (assegni bancari - biglietti al portatore - buoni agrari - fedi di credito e altri titoli nominativi a vista - vaglia postali, cedole e titoli diversi da riscuotere) e biglietti somministrati dalla B. I. (decreto 1 maggio 1866, n. 2873).*

production expand in the short term given the available plant endowment?); and the on the manufacture techniques, (i.e. how much crude oil was necessary to produce a ton of petrol?). Nevertheless, for coke the situation should not be radically different from that of coal, considering the substantial German supply potential.

Table 4. Italian imports of oil products from the United States **(thousand of t.)**

Month ® *Product* –	Jul 34	A	S	O	N	D	Jan 35	F	M	A	M	J
Crude	-	11.4	-	-	-	-	-	-	-	-	-	-
(a)	*0*	*59*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
(b)	5.3	7.2	4.1	4.1	3.5	4.7	3.6	2.9	3.3	3.9	4.7	5.6
(a)	*80*	*90*	*76*	*75*	*73*	*75*	*63*	*61*	*59*	*67*	*66*	*66*
(c)	0.8	2.1	1.2	2.8	2.1	1.3	1.4	1.0	1.4	0.7	0.3	0.3
(a)	*6*	*11*	*6*	*12*	*16*	*11*	*12*	*11*	*19*	*6*	*5*	*3*
Petrol	3.1	2.3	0.7	2.7	1.2	1.4	1.8	1.0	2.6	3.4	2.8	0.8
(a)	*12*	*6*	*2*	*7*	*4*	*4*	*7*	*5*	*10*	*11*	*9*	*2*
(d)	4.7	7.6	6.8	4.3	4.6	6.9	1.6	2.3	3.1	6.7	2.7	3.5
(a)	*8*	*9*	*7*	*4*	*4*	*7*	*1*	*2*	*3*	*7*	*3*	*3*

(a) Percentage of the total Italian import of the commodity during the month;
(b) Lubricants;
(c) Fuel oil;
(d) Residual oil.
Source: Italy. Istituto Centrale di Statistica, *Statistica*, various years.

Repeating the analysis for petrol and other oil derivatives would necessitate hazardous hypotheses on how much of the curtailed crude oil supply would have been refined, and how much of it would have been directly consumed or used unrefined by industry. Nevertheless, it may be useful to reproduce here the data on the contribution of the United States to the Italian import of oil and oil derivatives in the years 1934 and 1935, as reported in the Italian trade statistics (Table 4), and the data on consumption of oil derivatives by industrial sectors (Table 5 - liquid combustibles and motor fuels other than petrol; and Table 6 - petrol).[46]

[46] On the limitations of the data in Table IV see footnote to Table I, above.

Table 5. Usage by industry of liquid combustibles and motor fuels other than petrol, Industrial census 1937 - 1938

Sector	*(a)*	*(b)*
Transport, and communications	2,418,691	*
Textiles *(c)*	259,340	15.62
Chemicals	192,995	21.04
Engineering (1938)	173,188	9.85
Metallurgy	142,040	15.75
Foodstuffs	120,832	4.37
Glass, building materials, and non-metallic minerals *(c)*	117,978	57.63
Other industries *(c)*	59,068	19.12
Paper industry	36,498	23.92
Electricity production and distribution	30,189	*
Construction *(c)*	27,781	6.30
Clothing trade and furniture *(c)*	11,191	9.62
Mineral extraction	7,610	6.46
Leather and skins *(c)*	6,273	2.92
Industrial services	4,272	11.11
Wood transformation *(c)*	4,164	2.86
Printing industry *(c)*	3,407	44.53
Water and gas distribution	1,384	*
Phonographic industries and cinema	104	1.95

(a) Liquid combustibles and motor fuels different from petrol ***t.***: "*Combustibili - Liquidi - Olii combustibili (nafta ecc.)*", plus "*Carburanti - Nafta*", plus "*Carburanti - Altri*".
(b) (Input of liquid combustibles and motor fuels different from petrol)/Production (***g/lira***) = Physical input-coefficients = *(a)*/Sectoral production.
The column showing input-coefficients is incomplete because data on production for the sectors of "transport, and communications"; "electricity production and distribution"; and "water and gas distribution" were not collected at the time.
(c) Data do not include craft workshops.

Demand for oil derivatives was unevenly distributed among sectors, with "transport, and communications" responsible for 67 per cent of the industrial consumption of liquid combustibles and motor fuels other than petrol (Table 5); and for 75 per cent of the industrial demand for petrol (Table 6). The most vulnerable sectors in terms of consumption of liquid combustibles and motor fuels other than petrol per unit of output (Table 5) were: "glass, building materials, and non-metallic minerals"; "printing industry"; "paper industry"; and "chemicals". The "printing industry" was also particularly exposed in terms of consumption of petrol per unit of output (Table 6). It seems obvious that "transport and

Table 6. Petrol usage by industry - Industrial census 1937 - 1938.

Sector	*(a) Petrol* ***t.***	*(b)*
Transport, and communications	309,869	*
Engineering (1938)	31,382	1.79
Construction *(c)*	21,137	4.79
Foodstuffs	8,889	0.32
Textiles *(c)*	8,632	0.52
Chemicals	6,244	0.68
Other industries *(c)*	4,453	1.44
Industrial services	4,381	11.39
Glass, building materials, and non-metallic minerals *(c)*	3,363	1.64
Metallurgy	2,987	0.33
Wood transformation *(c)*	2,800	1.93
Paper industry	2,786	1.83
Water and gas distribution	1,873	*
Printing industry *(c)*	1,596	20.86
Mineral extraction	1,420	1.21
Leather and skins *(c)*	918	0.43
Clothing trade and furniture *(c)*	633	0.54
Electricity production and distribution	192	*
Phonographic industries and cinema	31	0.58

(a): "*Carburanti - Benzina*".
(b) (Input of petrol)/Production (***g/lira***) = Physical input-coefficients = *(a)*/Sectoral production. For the petrol domestic production the source is: Rey *I conti*, p. 126. For import the source is: Italy. Istituto Centrale di Statistica, *Bollettino mensile*, various years. The column showing input-coefficients is incomplete because data on production and value added for the sectors of "transport", "electricity production and distribution", and "water and gas distribution" were not collected at the time.
(c) Data do not include craft workshops.

communication would score by far the highest vulnerability in terms of consumption of input per unit of output for all oil derivatives, had the output of the sector been reported in the industrial census.[47] The data on the consumption of

[47] In 1935 - 1936 the autonomous Italian oil refinement capacity was still extremely limited (see: Rispoli, 'L'evoluzione', p. 123.

On the private motorisation of Italy, Rey reports that by 1931 there were 62,326 lorries, 18,6131 cars, and 72,048 motorcycles on the Italian roads. By 1937 they became respectively 79,168, 271,190, and 149,185. It is interesting to note that in 1936 there is the only decrease in the Annual Vehicle Licensing Tax payments. Lorries decreased by 12.7%, car by 8.8% and motorbikes by 7.9%. This is a clear sign of constraints on the side of private petrol and motor fuel consumption (see: Rey, *I conti*, p. 164).

electric energy has been omitted here because of the marginal contribution of combustibles to Italy's production of electric energy in the thirties.[48]

6. Oil Dependency: An Econometric Analysis

In the 1930s Italy was almost completely dependent on foreign supplies for her coal and oil needs (see: Table 1, above). The Italian economy was also relatively small in relation to international trade. This meant that the quantities of the commodities required by Italy could hardly influence their international prices. It can then be assumed that in the period starting in January 1930 and ending with the beginning of the sanctions in October 1935, Italy faced an international supply of oil which was completely elastic. At the externally-determined prices Italy could buy all the petroleum she needed. Making this reasonable assumption, and within the theoretical framework set up by C. J. Morrison, and followed by N. Rossi and G. Toniolo for their research on Italy's performance during this century, one can estimate the Italian monthly demand schedule for crude oil.[49]

In order to obtain the monthly demand schedule for crude, let us consider a production technology characterised by non-constant return to scale and semi-fixed input factors. The technology will now be described by the restricted cost function:

$$c_v = c_v\,(w, y, k, t),$$

which defines the minimum production cost to produce a given output level y, with a given level of semi-fixed inputs (vector k), and where y is the production level (output), t is a variable that describes the technological level, and w is the input price vector associated with the vector x of I inputs.

In more detail, a Leontief's generalised functional form can be used to describe the short-term restricted cost function. This should be modified in order to take account of the existence of semi-fixed inputs. Assuming three variable inputs (labour (l); imported crude oil (o); and other imported inputs (m)), and one semi-fixed input (capital (k)), one obtains:

---

[48] Vera Zamagni gives a 92% figure for the electricity produced by hydro-power in this period. See: Zamagni, *Dalla periferia*, p. 361.

[49] See: Morrison, 'Quasi-fixed'; Morrison, 'Markup in U.S.'; Morrison, 'Markup behavior'; Morrison, 'Market'; and Rossi, and Toniolo, 'Un secolo'.

where: $i, j = o, l, m$; and where a, b, and g are technological parameters. The corresponding system of demand schedules for the variable inputs is:

Here the interest is focused on the demand for crude oil. The parameters of the crude oil demand equation (x_O/y), are calculated on monthly data for the period January 1930 - December 1935, using OLS estimators (see: Appendix A for a discussion on the data used). In order to do this the equation x_O/y has been changed to include among the regressors lagged values of x_O/y. Lags up to 12 have been incorporated in the initial regression. In addition, 11 dummy variables JAN, FEB, ... , NOV, are included among the regressors to estimate possible seasonalities in the monthly data-set. Moreover, a dummy variable named POL accounts for the effect of the growing international tension from August 1935 on the stocking of crude oil. The dummy remains at zero except from August 1935 when it becomes one. The choice of August 1935 is based on the description of the European diplomatic environment made by Walters. On 27 June the final results of the Peace Ballot were published. This markedly changed the British attitude towards the Italo-Ethiopian *querelle*. Now the British diplomatic interest in a low profile solution to the crisis in order to prevent Mussolini from getting too close to the newly aggressive Germany gave way to domestic political concerns. With the approach of general elections, the clear result of the Peace Ballot in favour of League membership and for the fulfilment of the Covenant enhanced the

position of those within the British Cabinet who favoured a 'hard line' towards Italy. The change in the British attitude was enough to move the cumbersome League machine against Italy. As Walters writes:

> The lead which the British government now began to give was neither clear nor resolute. But it was enough, when the time came, to rally the Members of the League and to produce some effort at least to carry out the obligations of the Covenant.
>
> From June onwards, therefore, the real nature of the Italo-Ethiopian crisis became increasingly evident. It was a struggle between Fascist Italy and the League.[50]

A dummy variable denominated SAN considers the effect on crude oil demand of the widespread expectation in the months of November and December 1935 of sanctions on petroleum products. Technical progress is here considered to be introduced at a constant rate throughout the six years at issue. The variable *t* is then expressed by a simple counter.

A simplified version of the equation was obtained in order to eliminate possible sources of unnecessary multi-collinearity. In particular, as a result of the strong multi-collinearity shown by $(w_o/w_l)^{0.5}$ and $(w_o/w_m)^{0.5}$, the second of the two was substituted with $(w_m)^{0.5}$. Moreover, considering the elementary structure of many of the variables used, many regressors become wholly redundant. The following simplified version of the above equation has been employed:

Finally, the import of crude oil in one month is taken to be the result of the demand for crude oil expressed in the previous months. This is due to the time that elapses between the acquisition of the commodity abroad and its delivery to the Italian harbours. In other words, the average time here assumed to be necessary to ship crude from its production places to Italy is at least one month. It was assumed that the import of crude oil in one month depends on the determinants of the demand for oil in the previous three months. This allows us to estimate x_o/y against lagged regressors (and thus using OLS instead of simultaneous equation estimation methods). Lags of up to three months have been included for the variables: $(w_o/w_l)^{0.5}$; $(w_m)^{0.5}$; $(k/y)^{0.5}$.

To reduce the usual undesirable characteristic of the error term arising from the use of time series, the explanatory and the dependent variables were taken in the

[50] Walters, F. P., *A history*, p. 636.

first difference of the natural logarithm. The estimated equation for the demand of crude oil is then:

=0.506-0.685* -0.293* +

-0.280* -0.355* +

-3.599* +34.099* +

+16.518 -0.462*JAN-0.669*FEB-0.825*MAR+

-0.452*APR-0.944*JUL-0.671*SEP-0.803*NOV+

-0.921*POL+0.883*SAN.[51]

Let us underline some features of the above equation. First, technical progress *t* played no role in changing the ratio between crude oil input and industrial production over the six years at issue.

Second, crude oil demand is elastic to wage levels and to the price of other import. This suggests that in the period at issue there was a certain degree of substitutability between crude oil and labour and between crude oil and other imported commodities.[52]

From the equation above it is possible to retrodict the crude oil demand during the sanction months. If the restrictions on export of crude oil to Italy had started in November 1935, the effects on the petroleum imported by Italy would have started to appear in December 1935. Taking this month as the starting point of the retrodiction exercise, and assuming with the League experts that Italian stocks were equivalent to some two months' consumption, the effects on industrial production would have appeared from March 1936.

[51] On the statistical significance of the regression and its behavioural characteristics see: Appendix B.

[52] This result does not confirm the findings of Rossi and Toniolo regarding the structural absence of substitutability between energy import and labour as a characteristic of the Italian economic system from 1890 to 1990 (see: Rossi, and Toniolo, 'Un secolo', p. 27).

The retrodicted level for (hereafter) are:[53]

Month	
December 1935	0.696576
January 1936	-0.0512
February 1936	0.008146
March 1936	0.129812
April 1936	-1.00146
May 1936	1.316353
June 1936	-24.6335

The retrodicted level for crude oil demand was respectively:[54]

Month	
March 1936	22,940 ***t.***
April 1936	8,400 ***t.***
May 1936	31,656 ***t.***
June 1936	0 ***t.***

A monthly "peace-time supply" of 11,415 ***t.*** from the United States would have covered on average only 72 per cent of the Italian demand, causing a

[53]
[54] League of Nations, 'Dispute', p. 5.
From the equation:

one can easily obtain the:

Starting from December 1935 and utilising the predicted value for ; and the historical levels for y_t and $x_{o,t-1}/y_{t-1}$ one can calculate:

From January 1936 the formula will be:

correspondent 28 per cent decrease in industrial production in the months from March to June 1936.[55]

Nevertheless, the regression above shows that the fascist leadership had alternative ways of decreasing the demand of crude oil without reducing production. The Italian State granted itself a monopoly on imports of coal, copper, nickel, and tin in July 1935; and on oil imports in October 1935. Imports of many other strategic materials were centralised in the following months. Wage movements were the object of authoritative decisions by the central government. Thus, during the sanctions, the Administration could have easily raised the relative price of crude oil against labour and other energy inputs by means of increases in controlled oil price, and decrease in real wages.[56]

A second scenario with a 100 per cent increase in the relative price of crude oil from November 1935 is examined below. The new predicted values of would have been the following:

Month	
December 1935	0.668803
January 1936	-1.46154
February 1936	0.873515
March 1936	-0.00954
April 1936	-0.78667
May 1936	1.498758
June 1936	-32.9639

From which one obtains the following demand:

Month	
March 1936	11,255 ***t.***
April 1936	5,109 ***t.***
May 1936	23,104 ***t.***
June 1936	0 ***t.***

[55] In APPENDIX A is shown how the figure of 11,415 ***t.*** is calculated.

[56] The decrees relative to the state monopoly over imports of strategic materials are: R. D. L. 24 ottobre 1935 No. 1880; R. D. L. 7 novembre 1935 No. 1965; and R. D. L. 15 gennaio 1936 No. 1273. See: Guarneri, *Battaglie*, pp. 510 - 512.

That shows that had the regime increased the relative price of oil against labour from November 1935 and the United States provided a monthly supply of 11,415 ***t.***, industrial production levels would have been maintained (with a slight contraction in May 1936) throughout the crude oil sanctions.

These results are entirely dependent on the figure of 11,415 ***t.*** of crude oil provided by the United States as "peace-time supply". This figure is considerable, and is the maximum that could have come under the "peace-time" label. This shows how the success of an oil embargo was completely dependent on the attitude of the United States, and how the "peace-time" formula was too elastic to be regarded a sufficient commitment to the League's prospective action against Italy.

6. Conclusions

The analysis conducted in this article shows how in 1935 the League alone had very little chance of forcing Italy to back down by means of a commercial embargo. Even if an embargo had been imposed on combustibles (where Italian dependency from abroad was more acute) the effects would have been negligible for the conduct of the invasion of Ethiopia, and marginal on industrial production. Coal, petroleum, oil derivatives, and other strategic materials could easily have been secured by Germany and the United States.

In particular, the attitude of the United States was decisive in the case of an oil embargo. Only a complete adherence by the United States to the League's hypothetical oil embargo could have caused Italy crippling economic difficulties. Had the United States taken the 'hard line' of supplying Italy only with the average monthly delivery of crude oil recorded in the peace-time period from January 1930 to October 1935 (ca. 2000 ***t.***), Italian industrial production would have come to a complete stop in March 1936 with an 80 per cent fall over the previous levels.

These results confirm on one hand how the prevailing isolationist mood and policy of the United States in the inter-war years was at variance with the peace-keeping duties and responsibilities of its newly acquired role of greatest world power. On the other hand, it remains uncertain whether in 1935 the Administration and Congress of the United States could have resisted the converging pressure for a total embargo from overwhelmingly anti-fascist domestic public opinion, and from a united League of Nations, had the governments of Britain and France seriously intended to challenge the unco-operative attitude of the United States' Administration by taking a firmer stance against Italy. This question must be left to be debated by political historians.

APPENDIX A: The Data

The data used for the empirical implementation are monthly. Data for the period from January 1930 to December 1935 have been used to estimate the parameters of the model. The effects on production, prices, and employment of an embargo on crude oil were retrodicted running the estimated model with data relating to the sanction period (November 1935 - June 1936).

Crude oil (x_o). Monthly crude oil import (***t.***) from 1930 to 1935. Sources: Italy. Istituto Centrale di Statistica, *Statistica*, various years; Italy. Ministero delle Finanze, *Statistica*, various years. **Price (w_o).** As for the crude oil prices, the hypothesis is that Italy was a price taker. The series used for its completeness is that of the average monthly prices per barrel of Pennsylvania grade crude petroleum at the wells (Bradford). Source: United States. Department of Commerce. Bureau of Mines. *Mineral resources*, various years; United States. Department of the Interior. Bureau of Mines. *Minerals Yearbook*, various years; United States. Department of the Interior. Bureau of Mines. *Statistical*, various years.

Other imports (m). Italian monthly imports (months of June and December excluded). Source: League of Nations, *Monthly*, various years. The series has been transformed from current to constant 1938 prices using the import deflator published in Rossi, Sorgato, and Toniolo, 'I conti', p. 46. The hypothesis used is that the change from one yearly deflator value to the next yearly deflator value happens at a constant rate throughout the year. Finally the resulting series has been transformed into an index with July 1930 = 100. **Price (w_m).** Source: Monthly import prices (1913 = 100, 45 goods), and monthly export prices (1913 = 100, 23 goods) were collected by the Consiglio Provinciale dell'Economia Corporativa di Milano), and published by ISTAT for the period 1929 - 1934. They were the prices observed on Milan's commodities market. In 1935 the data where collected but not published. They are available at the ISTAT library in Rome (ISTAT(L), Consiglio Provinciale delle Corporazioni di Milano, Relazione statistica per la provincia di Milano 1935. I.47.E.12). The series ceased completely after 1935. Nevertheless, ISTAT published another set of monthly data of import and export prices (1925 = 100). This time it was collected by the Confederazione Fascista degli Industriali. The 1913 and the 1925 series overlapped somehow irregularly in 1934 and 1935. It is only in 1936 that the 1925 series is collected and published regularly every month. The 1925 series have been used to integrate the 1913 series for the months from January to June 1936. August 1935 was the last month for which data exists both in the 1913 and in the 1925 sets, and so, has been used to bridge the two sets.

Labour (*l*). Index of monthly average employment (industry - 1929 = 100). Source: Zamagni, 'Una ricostruzione', p. 371. **Wages (w_l).** Index of the real monthly wages (1929 = 100). Source: Zamagni, 'Una ricostruzione', p. 368.

Capital (*k*). Stock of capital: plants and industrial equipment in billion lire (constant 1938 prices). Source: Rossi, Sorgato, and Toniolo, 'I conti', p. 38. The series published in Rossi, Sorgato, and Toniolo is annual. Being a stock variable it is safe to assume that the data is relative to the stock of capital at the end of the year. The series has been transformed into a monthly one assuming a linear increase throughout each year. The resulting series has been smoothed repeatedly in order to reduce the abrupt changes in the pace of capital accumulation at the beginning of each year. The series has then been transformed into an index 1938 = 100.

Output (*y*). Production index (1930 = 100). Source: Italy. Ministero delle Corporazioni, *Sindacato*, various years.

Technical change (*t*). A trend variable has been included to account for technical change in the period.

x_o is the variable of interest for the retrodiction exercise. The retrodiction scenario imagine a monthly crude oil supply from the United States to Italy equalling the maximum monthly crude oil supply from this country in the period January 1929 to October 1935. This maximum was reached in August 1934 with 11,414 ***t.*** of crude oil shipped across the Atlantic to Italy. This value is used to retrodict the required production levels necessary in order for demand to match the reduced supply of crude in the sanction months; firstly, *coeteris paribus*, and then with adjusting w_o/w_l .

APPENDIX B: The Regression

Listwise Deletion of Missing Data

Dependent Variable:	
Multiple R:	.89587
R Square:	.80258
Adjusted R Square:	.73940
Standard Error:	.27190

Analysis of Variance

	DF	**Sum of Squares**	**Mean Square**
Regression	16	15.02747	.93922
Residual	50	3.69659	.07393

F = 12.70382 **Signif F =** .0000

* * * * M U L T I P L E R E G R E S S I O N * * * *

Dependent Variable:

---------- Variables in the Equation ----------

Variable	**B**	**SE B**	**Beta**	**Tolerance**	**VIF**	**T**	**Sig T**
	-.685	.109	-.686	.329179	3.038	-6.266	.000
	-.293	.136	-.296	.209237	4.779	-2.155	.036
	-.280	.134	-.280	.220383	4.538	-2.093	.042
	-.355	.104	-.346	.383615	2.607	-3.414	.001
	-3.399	1.789	-.142	.796044	1.256	-2.012	.050
	34.099	9.536	.423	.282505	3.540	3.576	.001
	16.518	5.922	.237	.545990	1.832	2.789	.008
JAN	-.462	.151	-.230	.700689	1.427	-3.062	.004
FEB	-.669	.150	-.333	.706271	1.416	-4.447	.000
MAR	-.825	.160	-.410	.621004	1.610	-5.140	.000
APR	-.452	.168	-.224	.567814	1.761	-2.692	.010
JUL	-.944	.147	-.510	.622683	1.606	-6.405	.000
SEP	-.671	.194	-.362	.359478	2.782	-3.457	.001
NOV	-.803	.175	-.434	.443150	2.257	-4.593	.000
POL	-.921	.211	-.458	.358836	2.787	-4.363	.000
SAN	.883	.331	.284	.347702	2.876	2.669	.010
(Constant)	.504	.074				6.768	.000

No.	Eigenval	Cond Index	Variance Constant	Proportions		
1	3.12771	1.000	.00125	.01259	.01402	.01410
2	2.05215	1.235	.01502	.00021	.00014	.00093
3	1.83372	1.306	.02340	.00106	.00311	.00398
4	1.54838	1.421	.00215	.00714	.00834	.00202
5	1.35568	1.519	.00096	.03738	.00033	.00022
6	1.10383	1.683	.00004	.00969	.00009	.01110
7	1.06968	1.710	.00615	.01617	.00121	.00002
8	.99137	1.776	.00089	.00000	.00041	.00090
9	.95254	1.812	.00910	.01497	.00242	.01100
10	.74188	2.053	.00120	.08134	.00978	.00319
11	.62465	2.238	.01214	.01017	.00812	.02432
12	.48899	2.529	.03851	.01498	.00141	.00262
13	.40094	2.793	.00100	.00100	.09269	.02819
14	.34474	3.012	.01340	.04203	.03489	.09121
15	.19223	4.034	.00077	.28752	.03525	.04274
16	.10470	5.466	.26301	.20988	.53284	.50661
17	.06681	6.842	.61102	.25388	.25495	.25685

					JAN	FEB
1	.01217	.00005	.01164	.00624	.00328	.00000
2	.00003	.00014	.00194	.00991	.00042	.00187
3	.01436	.03348	.00353	.04314	.02380	.04351
4	.04988	.00660	.01152	.02435	.02007	.00037
5	.00085	.11340	.02046	.00030	.04715	.00148
6	.00486	.06697	.00234	.04406	.00026	.02428
7	.00116	.07737	.00639	.00223	.15964	.00686
8	.00161	.00597	.00331	.00066	.09491	.35781
9	.00248	.17169	.01873	.00629	.04283	.00179
10	.01088	.00001	.01011	.04618	.00180	.13159
11	.02752	.12440	.00626	.17402	.10503	.06076
12	.00784	.27701	.08977	.04054	.06111	.01909
13	.35590	.04648	.00302	.00510	.03554	.01033
14	.00932	.00128	.16301	.23889	.15927	.00129
15	.05816	.02427	.01074	.14510	.04919	.02225
16	.36853	.03120	.05621	.12224	.11054	.04930
17	.07444	.01968	.58105	.09077	.08515	.26742

	MAR	APR	JUL	SEP	NOV	POL	SAN
1	.00174	.00009	.00074	.00870	.00909	.00000	.00007
2	.00033	.00306	.00231	.00154	.01512	.05511	.05318
3	.01171	.00778	.01468	.00314	.00656	.00200	.00626
4	.01502	.01310	.00491	.04898	.03156	.00578	.00021
5	.08660	.02495	.06082	.00052	.00485	.00004	.00142
6	.00317	.23190	.02605	.02638	.00013	.00016	.00733
7	.00978	.00001	.22952	.00317	.00011	.00853	.00244
8	.10605	.00011	.00015	.00429	.03069	.00132	.00047
9	.09512	.10079	.02728	.00056	.01336	.02870	.00002
10	.17959	.02295	.01263	.02871	.05376	.00871	.01638
11	.00719	.01725	.00069	.03394	.04084	.01110	.07660
12	.03382	.00943	.17689	.01561	.09047	.01205	.06746
13	.00392	.03574	.01560	.16390	.02284	.02568	.03344
14	.02661	.02092	.02219	.00001	.23862	.01890	.01044
15	.00720	.02070	.04098	.11418	.00816	.61161	.34089
16	.07327	.20204	.00160	.08010	.04045	.01653	.05054
17	.33887	.28920	.36295	.46629	.39340	.19379	.33285

The other variables included in the initial regression are not statistically significant.

The equation passed the usual tests on the residuals' behaviour. In particular, the null hypothesis was tested against the hypothesis of autocorrelation of the *n*-th order, where *n*=1, ..., 12. Moreover the null hypothesis was tested against the alternative of residuals generated by an AR(*p*) or by an MA(*p*) process where *p*=2, ...,12.

Normality in the distribution of the residuals was not tested because it is here assumed that 67 observation is a big enough sample to have consistent OLS estimators. It is known that with lagged dependent variables 'even without the assumption of normality for the *u*'s the OLS estimators will be consistent and asymptotically normally distributed'.[57]

[57] Johnston, *Econometric*, p. 362.

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