Understanding the Great Depression: What can we learn from the Italian Experience?

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ABSTRACT

We analyze the Italian economy in the interwar years. In Italy, as in many other countries, the years immmediately after 1929 were characterized by a major slodown in economic activity as non farm output declined almost 12We argue that the slowdown cannot be explained solely by productivity shocks and that other factors must have contributed to the depth and duration of the the 1929 crisis. We present a model in which trade restrictions together which wage rigidities produce a slowdown in economic activity that is consistent with the one observed in the data. The model is also consistent with evidence from sectorial disaggregated data. Our model predicts that trade restrictions can account for about 3/4 of the observed slowdown while while wage rigidity (monetary shocks) can account for the remaining fourth..
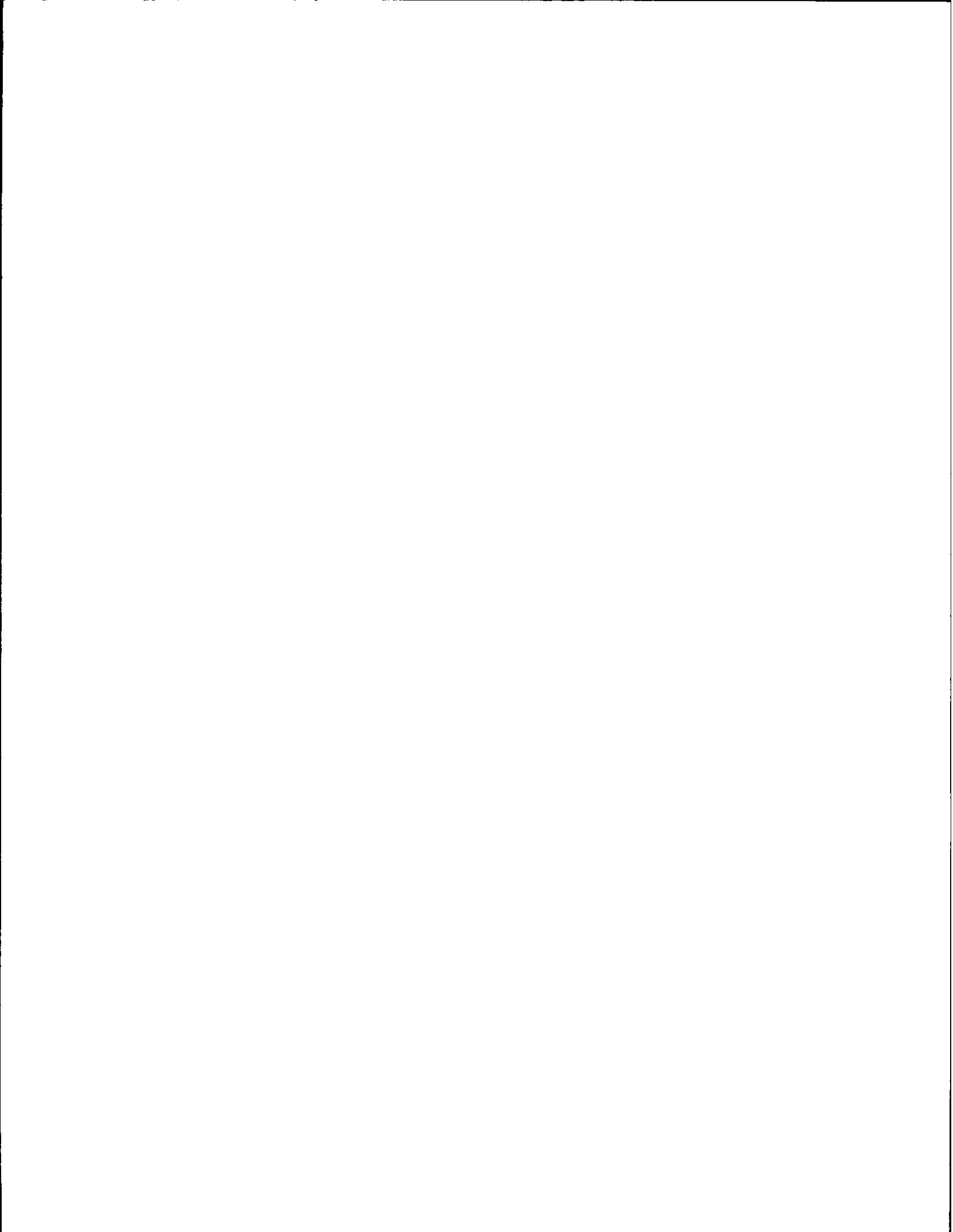
1. Introduction

The economic recession experienced by many countries at the end of the 20's and at the beginning of the 30's—the great depression—also affected Italy. Despite the different structure of the Italian economy due to the lower degree of industrial development, the dynamics of the Italian recession was not very different from the recession of more industrialized countries like England, France and the United States. The fall in aggregate production was smaller due to the smaller role played by the industrial sector. But the magnitude of the fall in industrial production has been as severe as in more industrialized countries.

The key features of the Italian depression can be summarized as follows:

(i) Persistent decline in international trade.

(ii) Initial fall in the relative prices of Tradable and Non-Tradable products.

(iii) Large fall in hours worked and production in the Tradable sector, but negligible changes in the Non-Tradable sector.

(iv) Large fall in investment.

(v) Stability of the real wages.

A striking aspect of the great depression is that it involved many countries and during the same period of time. This aspect leads us to investigate mechanisms of international transmission. Among these mechanisms, the fall in international trade constitutes the obvious candidate. In fact, all countries affected by the great depression also experienced a drastic and persistent fall in foreign trade.

Finding the causes of the fall in foreign trade is not difficult. Many countries, including Italy, implemented protectionist policies starting at the end of the 20s'. These policies took several forms like import tariffs, currency control and quota restrictions. The consequences were a dramatic fall in international trade. Can this fall in international trade explain the great depression? In this paper we claim that the fall in foreign trade can potentially explain the economic downturn of Italy in the 30s', and that the downturn has been amplified by the rigidity of *real* wages.

We develop an open-economy model with two sectors of production: the Tradable sector and the Non-Tradable sector. The tradable and the non-tradable productions are then combined to produce consumption and investment in the two sectors of production. A key property of the model is that foreign imports are an important input in the production of investment in the tradable sector. This assumption is based on the import structure of Italy in the 20s' and 30s', where a significant share of non-agriculture imports were investment goods for the industrial sector. This dependence from the import of investment goods—motivated by the lower development of the industrial sector in Italy—has been an important mechanism of transmission of the international economic crisis in Italy. Using the calibrated version of the model, we show that the contraction in the foreign trade has the potential to account for the first four features of the Italian depression listed above. The role of the fifth feature—the stability in real wages—has been to amplify the consequences of the trade contraction.

The organization of the paper is as follows. In the next section we describes the main facts about the Italian economy during the two decades preceding the second World War. After the empirical analysis, section 3.describes the economic model and section 4.discusses the choice of the parameters. In section 5.we use the model to investigate the importance

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of trade restrictions and wage rigidities for understanding the Italian recession. Section 6. concludes.

2. The Italian Economy in the Interwar Years

In this section we present some basic facts about the evolution of the macroeconomic variables in Italy in the interwar years. We first look at Italy in the international context by documenting the patterns for GDP, industrial production and international trade in Italy and in other major countries. Then we document the pattern for the main Italian macroeconomic aggregates and finally we look at some sectorial disaggregated data.

A. Italy in the International Context

We document the intensity of the great depression in Italy, looking at cyclical indicators in Italy and in other major countries. Figures 1 and 2 show the pattern for GDP and Industrial production in the interwar years while table 1 present simple measures of depth(peak to trough percentage drop) and persistence(time to reach back to he 1929 level). It is clear how also in Italy the years of the depression represented a major and persistent slowdown in GDP growth, although less severe than in some of the other major countries, and a significant and persistent[1] drop in industrial production. The graphs and the table also show the synchrony of the depression in all major countries, the fact that the 1929 depression was for all countries much more sever that the other interwar recessions and the fact that the size and the persistence of the drop in industrial production are, in all countries, bigger than the drop in GDP.

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[1] To get a feel for the magnitude it might be useful to compare the 1929 recession to the 1973 US recession, the sharpest in US postwar. In 1973 GDP contracted 1.7% and took 2 years to go back to the 1973 level while industrial production fell by 10% and took 4 years to return to the 1973 level.
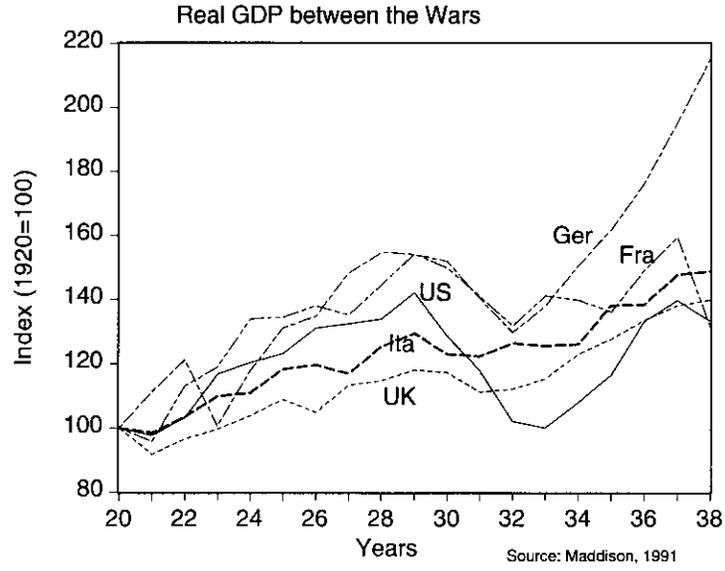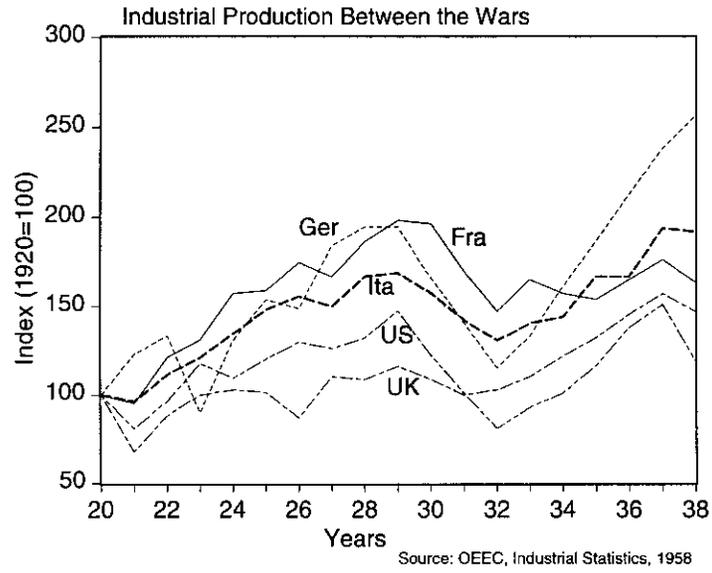
Figure 1:

Figure 2:

Table 1. Decline from peak to trough and years to return to 1929 level

	GDP.		Industrial Production	
	Decline	Years	Decline	Years
United States	29.6%	10	45.2%	>10
France	14.6%	10	25.6%	>10
Germany	15.8%	6	40.8%	7
Italy	5.5%	6	22.7%	8
United Kingdom	5.8%	4	14%	5

Source for GDP: Maddison (1991). For IP: OEEC, Industrial Statistics (1958)

The fact that the great depression has been so synchronous across countries points toward explaining factors that are common across countries. One possible candidate is the evolution of trade in the interwar years. Table 2 shows that trade (measured as imports and exports) fell during the depression years more severely than GDP in all countries, suggesting the presence of increasing obstacles to trade during the depression. A more direct evidence of the trade restrictions are the tariffs increases in the late twenties and in the thirties. Crucini and Kahn (1996) report that average ad valorem tariffs in sample of industrialized countries raised from 9.9% in 1920-1929 to 19.9% in 1930-1940. For Italy the increase in the same period is from 4.5% to 16.8% . Also in Italy a set of rules and regulations was introduced in the early thirties that explicitly attempted to reduce imports. Examples of these rules include the requirement of Italian products to have a minimum level of Italian intermediate inputs, the prohibition of the import of goods through the postal service, the strict application of preference rules for domestic products in government and military purchases and foreign

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exchange controls (for an extensive list of import restrictions see Guarneri, 1988, Chp. 7).

Table 2. Fall in Real GDP, Real Exports and Real Imports, 1929-1932

	GDP Decline	Imports Decline	Exports Decline
United States	28.2%	39%	48%
France	14.6%	11%	41%
Germany	15.8%	29%	41%
Italy	2.5%	28%	19%
United Kingdom	5.8%	12%	37%

Source for GDP: Maddison (1991). For Trade: Maddison (1962)

B. Performance of the non-farm sector

One of the reason why in Italy the drop in GDP during the depression has been smaller than in other countries is the presence of a large and traditional agricultural sector that was not much affected by the business cycles. Figure 3 presents the sectorial decomposition of GDP and shows how agricultural production was large (an average of 35% of GDP) but relatively unaffected by the great depression.

In the remaining part of the paper therefore we will focus our analysis on the non farm sector. Figure 4 shows the pattern of non food real consumption, non farm real investment and for output and total hours worked in the non farm sector in the interwar years (all normalized to 100 in 1929). Notice that while consumption is little affected by the great depression the fall in investment is much more severe and prolonged than in other interwar recessions. Hours and output also fall by more than 10% and remain below the 1929 level for

Sectoral decomposition of GDP

Billions of 1938 lire

Services and Construction

Agricolture

Industry and Mining

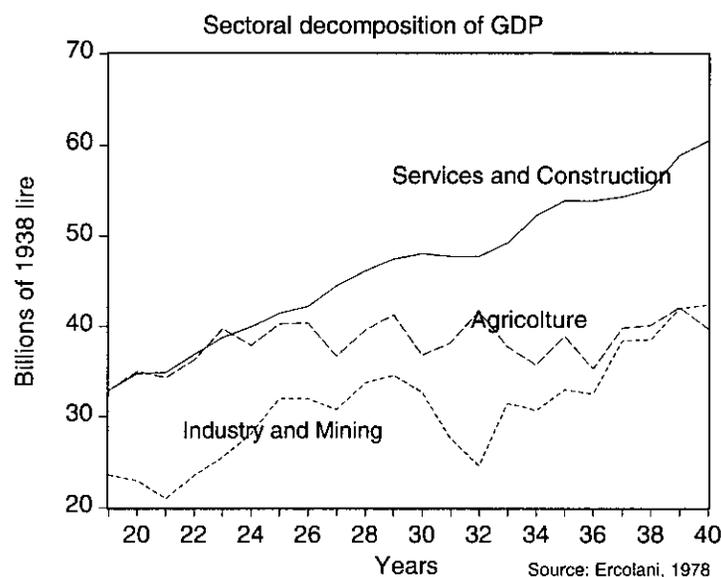Years   Source: Ercolani, 1978

Figure 3:

few years. Figure 5 plots the pattern of total factor productivity in the non farm sector and

we can observe that, although during the great depression we observed a fall in productivity,

the fall it is not significantly different from the declines observed in other interwar recessions,

thus suggesting that factors other than productivity might have accounted for the severity

and the persistence of the great depression. As we already mentioned the evolution of trade

might be one of these factors. Figure 6 plots the ratio of non farm exports and imports to

GDP in Italy from 1919 to 1940 and shows how the ratios have rapidly declined during the

great depression and remained low in successive years.

C. Real Wages and Sectorial Evidence

In the model presented in the next section we will argue how the reduction in trade can

alter relative prices between tradables and non tradables that in turn can change the relative
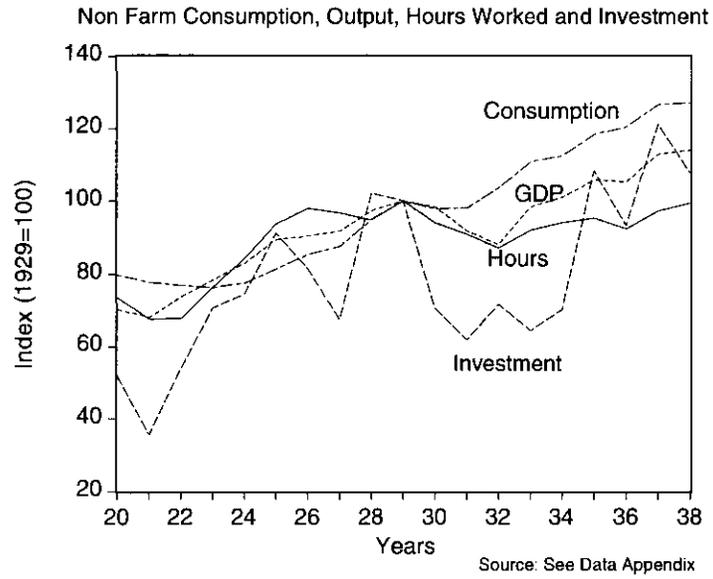
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Non Farm Consumption, Output, Hours Worked and Investment

Figure 4:

Non Farm Total Factor Productivity

Figure 5:

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Non Farm Imports and Exports over Non Farm Output
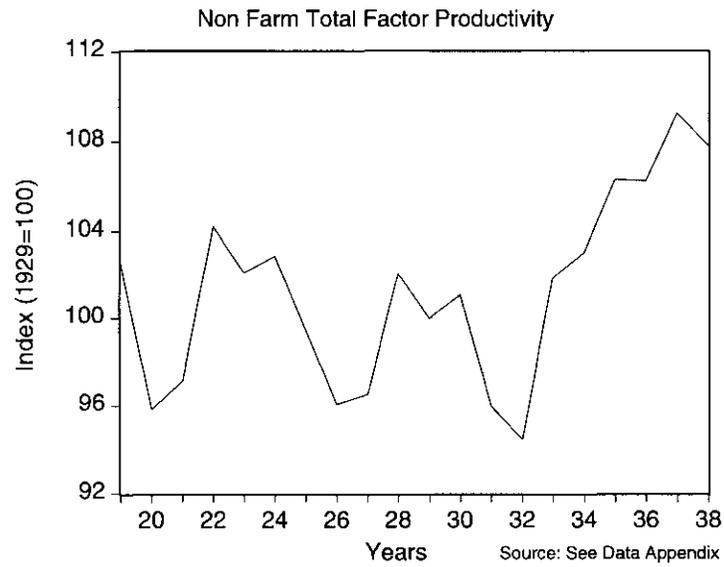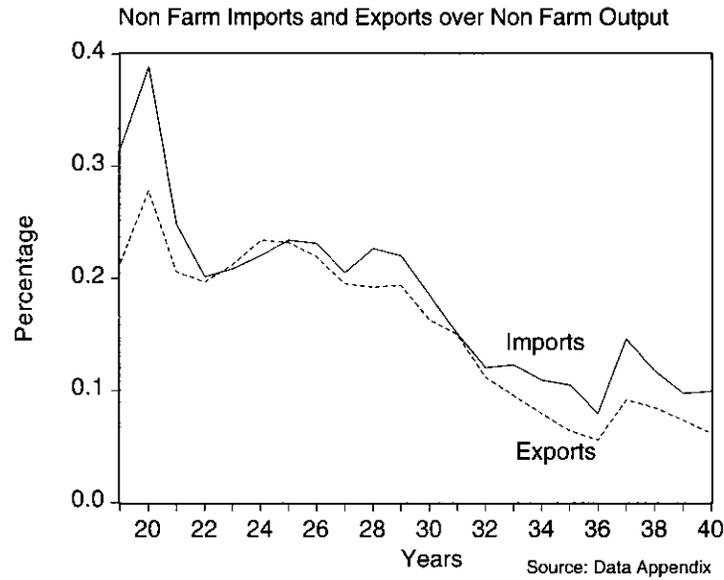

Figure 6:

wages in the two sector and the relative production. In this section we present the patterns

for relative prices, relative wages and production in the two sectors in Italy in the interwar

years. Figure 7 shows how the relative price of non-farm tradables good (manufacturing plus

mining) fell rapidly relatively to the price of non-tradables goods (construction and services).

Figure 8 show the patterns for hours worked and real wages in the tradables and non

tradables sector. Here real wages want to measure relative labor costs and therefore they are

computed deflating the nominal wages in each sector by the price index for that sector. Notice

how the real wages in tradables behave differently from the real wages in the non tradable

because of the change in relative price between tradables and non tradables[2]. Notice also

that during the great depression there was a sharp and persistent increase in the real wages in

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[2] There is very little difference between the series for nominal wages in the different sectors so almost all the difference in the the pattern of real wages is attributable to the pattern of relative prices.

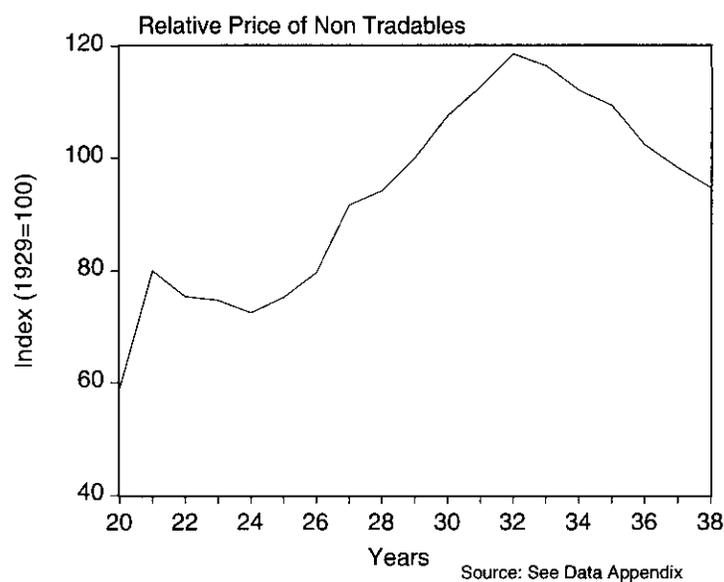Relative Price of Non Tradables

Figure 7:

the tradable sector associated with a large and persistent decline in total hours. The strong

negative correlation between real wage and total hours seems to indicate that the reduction

in hours worked were caused by movements along the aggregate labor demand rather than by

shocks in the labor demand itself, thus suggesting the presence of some form of wage rigidity.

Many economists (See for example Bernanke and Carey, 1996) have actually argued

that nominal wage rigidities might have caused reduction in labor demand and thus might

have been responsible for the slowdown. In Italy nominal rigidities do not seem very relevant

because of the particular political situation. The fascist regime was able, through the corpo-

rations system, to set the nominal wage and there was surprisingly little workers resistance

to nominal wages cuts[3]. After the 1929 crisis hit it seems that the deliberate nominal wage

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[3]Salvemini (1938, p.363) report the following quote by Einzig: "In no country was it so easy as in italy to obtain the consent of employees to a reduction of wages".

policy (see Zamagni, 1976) was to keep the real daily wage (that is the daily nominal wage deflated by the consumer price index) at the 1929 level. Together with this policy though a progressive reduction of the daily hours of work was implemented in the labor contracts. These two policies together implied that although the real(CPI deflated) daily wage was kept constant the real (CPI deflated) hourly wage was actually increasing. Figure9 documents the patterns for nominal hourly wages, hourly and daily real wages showing that even though the daily wage was fairly constant a significant increase in the real hourly wage has been registered. This pattern together with the behavior of the relative price of tradables caused, as we have seen in figure 8, a significant increase in the labor cost in the tradable sector. In the next section we develop a model in which trade restrictions together with real wage rigidities display patterns for the aggregate and sectorial variable that are consistent with the Italian inter-war evidence.

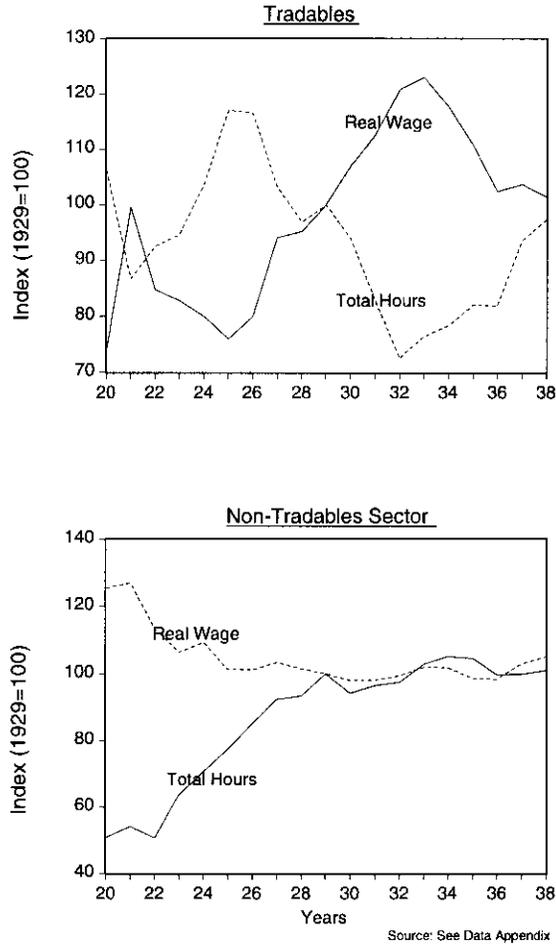Real wages (deflated with sector prices) in different sectors

Tradables

Non-Tradables Sector

Source: See Data Appendix

Figure 8:

3. The model

The economy is a two-sector open-economy model populated by a continuum of households that maximize the expected lifetime utility:

$$(1) \qquad E_0 \sum_{t=0}^{\infty} \beta^t U(C_t, 1 - H_t)$$

where β is the intertemporal discount rate, H_t are working hours and C_t is a composite consumption good resulting from the aggregation of three consumption inputs: consump-
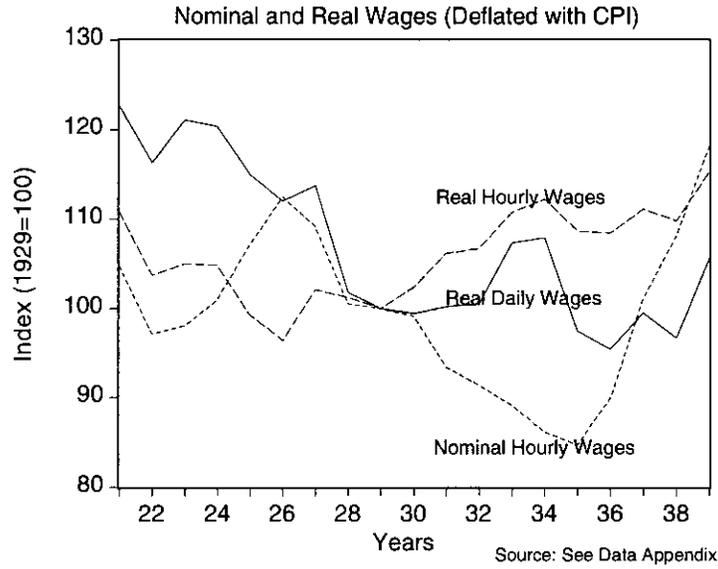
Figure 9:

tion goods produced in the Non-Tradable sector, $C_{N,t}$, consumption goods produced in the Tradable sector, $C_{T,t}$, and consumption goods imported from abroad, $C_{M,t}$. The aggregation function for these three inputs is:

$$(2) \quad C = \Phi(C_{N,t}, C_{T,t}, C_{M,t}) = \left[a_{c,N} \cdot C_N^{\frac{\sigma-1}{\sigma}} + a_{c,T} \cdot C_T^{\frac{\sigma-1}{\sigma}} + a_{c,M} \cdot C_M^{\frac{\sigma-1}{\sigma}} \right]^{\frac{\sigma}{\sigma-1}}$$

where σ is the elasticity of substitution among the three consumption inputs and $a_{c,j}$, $j = N, T, M$, are constant parameters determining the share of the intermediate inputs in the production of the consumption good.

Production takes place in two sectors—the Non-Tradable sector and the Tradable sector—according to the following constant return-to-scale technologies:

$$(3) \quad Y_i = A_i K_i^{\theta_i} H_i^{1-\theta_i}, \qquad i = N, T$$

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where A_i, K_i, θ_i and H_i are, respectively, the total factor productivity, the input of capital, capital share and the input of labor in sector $i = N, T$. Investment in the two sectors I_T and I_N is produced using two different constant return to scale technologies

$$
(4) \quad I_T = \Phi^T(i_{T,N}, i_{T,T}, i_{T,M}) = \left[a_{I_T,N} \cdot I_{T,N}^{\frac{\sigma-1}{\sigma}} + a_{I_T,T} \cdot I_{T,T}^{\frac{\sigma-1}{\sigma}} + a_{I_T,M} \cdot I_{T,M}^{\frac{\sigma-1}{\sigma}} \right]^{\frac{\sigma}{\sigma-1}}
$$

$$
(5) \quad I_N = \Phi^N(i_{N,N}, i_{N,T}, i_{N,M}) = \left[a_{I_N,N} \cdot I_{N,N}^{\frac{\sigma-1}{\sigma}} + a_{I_N,T} \cdot I_{N,T}^{\frac{\sigma-1}{\sigma}} + a_{I_N,M} \cdot I_{N,M}^{\frac{\sigma-1}{\sigma}} \right]^{\frac{\sigma}{\sigma-1}}
$$

where $I_{T,j}$ and $I_{N,j}$, $j = N, T, M$, are the intermediate inputs to produce investment in tradables and non tradables respectively, and $a_{I_T,j}$ and $a_{I_N,j}$, $j = N, T, M$ are constant parameters determining the share of intermediate inputs in the investment production. The resource constraints are:

$$
(6) \quad Y_N = C_N + I_{T,N} + I_{N,N}
$$

$$
(7) \quad Y_T = C_T + I_{T,T} + I_{N,T} + X
$$

$$
(8) \quad M = C_M + I_{T,M} + I_{N,M}
$$

where C_N, C_T C_M are the domestic consumption of Non-Tradable, Tradable goods and imports $I_{T,j}$, $I_{N,j}$, $I_{M,j}$, $j = N, T$ are the intermediate inputs used in the production of non tradables and tradables, X and M are the tradable goods exported abroad (exports) and total imports

Capital in both sectors depreciate at rate δ. Therefore, the stocks of capital evolve according to:

$$
(9) \quad K_{j,t+1} = (1 - \delta)K_{j,t} + I_{j,t}, \qquad j = N, T
$$

We assume that there is not international mobility of capital[4]. The equilibrium in the foreign sector is then given by the balance in the trade account, that is:

$$(10) \quad P_{M,t} \cdot M_t = P_{T,t} X_t$$

where $P_{M,t}$ is the price of the imported goods and $P_{T,t}$ is the price of the goods produced in the tradable sector (which is also the price for exports), all measured in terms of the composite consumption good C_t.

To close the model we need to specify the demand of exports from the foreign sector. We assume that the real demand of exports is always equal to the real demand of imports, that is, $X = M$. One way to interpret this assumption is by assuming the existence of two symmetric countries both affected by the same shocks and implementing the same policies. Extending the model to the case in which the two countries are affected by different shocks and implement different policies is not difficult. However, for the purpose of this paper, it will be convenient to assume perfect symmetry. Given the assumption that the real demand of exports is equal to the real demand of imports, the equilibrium condition in the trade sector (condition (10)) implies that the price of imports is equal to the price of goods produced in the tradable sector.

Finally we assume that there is a tariff on imports τ_t. The tariff revenue is rebated back to the households through lump-sum transfers. The transfers will be denoted by T_t and they are equal to $\tau_t C_{M,t} P_{M,t}$.

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[4]The assumption is largely motivated from the empirical evidence, showing how imports and exports moved very closely together and from the more direct evidence that international capital flows came to an almost complete stop in the late 1920s.(See Temin et al. 1997).

A. Agents' problems and equilibrium

Firms: The optimization problem of the firms in the two sectors is static and consists of the choice of capital and labor to maximize profits, that is:

$$(11) \quad \max_{K_{i,t}, H_{i,t}} \left\{ P_{i,t} \cdot A_i K_{i,t}^{\theta} H_{i,t}^{1-\theta} - R_{i,t} K_{i,t} - W_t H_{i,t} \right\}, \qquad i = N, T$$

where W_t is the wage rate, $R_{i,t}$ the rental rate of capital in sector $i = N, T$, and $P_{i,t}$ is the price of goods produced in sector $i = N, T$, all measured in terms of the price of the composite consumption good C_t.

The solution to the firm's problem is:

$$(12) \quad R_{i,t} = P_{i,t} \cdot \theta A_i K_{i,t}^{\theta-1} H_{i,t}^{1-\theta}$$

$$(13) \quad W_t = P_{i,t} \cdot (1 - \theta) A_i K_{i,t}^{\theta} H_{i,t}^{-\theta}$$

Households: Households choose a sequence of functions for hours worked, intermediate inputs in the consumption function, intermediate inputs in the investment functions to maximize (1), subject to the sequence of budget constraints:

$$(14) \quad W \cdot H + R_N K_N + R_T K_T + T$$

$$(15) \quad = (C_N + I_{N,N} + I_{T,N}) P_N + (C_T + I_{T,T} + I_{N,T}) P_T + (C_M + I_{T,M} + I_{N,M}) P_M (1 + \tau)$$

and to the technological constraints (2), (4), (5) and (9). Given the sequence of functions for prices and tariffs $\{W_t, R_{N,t}, R_{T,t}, P_{N,t}, P_{T,t}, \tau_t\}$, it is straightforward to write down the necessary first order conditions. After imposing the equilibrium aggregate conditions (6), (7) (8) and (10), the households and firm first order conditions, along with the proper

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trasversality conditions, determine the equilibrium of the economy.

4. Calibration

We want to interpret our model as a description of the Italian non farm sector in the interwar period so we use data that refer to that period as a basis for our calibration. The utility function is specified as $U(C_t, 1 - H_t) = \alpha \log(C_t) + (1 - \alpha)\log(1 - H_t)$, with $\alpha = 0.33$ that implies that household work one third of their time..We calibrate the economy on an annual basis and we set the intertemporal discount rate to $\beta = 0.96$ that is consistent with an average growth rate of consumption of 1.3% and with an average real risk free rate (rate on government bonds) of 6.2% computed for Italy in the period 1920-1940. In the specification of the model above we restrict the elasticities between the intermediate inputs for investment and for consumption to be the same and equal to σ. Using different elasticities for the different intermediate inputs would affect the results of the model but unfortunately we do not have enough empirical evidence to estimate the elasticities separately. In particular it would be problematic to estimate the elasticity between foreign and domestic tradables because in the interwar years international trade was heavily affected by tariffs and other form of barriers that are not reflected in the measures we have of international prices. Because of this we follow the practice of recent studies of international business cycles in assuming a single elasticity. In order to estimate the elasticity we notice that taking the standard deviation of the log of the ratio of the first order conditions for tradable and non tradable consumption we obtain

$$\sigma = \frac{Stdev\left(\log\left(\frac{C_T}{C_N}\right)\right)}{Stdev\left(\log\left(\frac{P_T}{P_N}\right)\right)}$$

so the elasticity can be obtained taking the ratio of relative consumption to relative prices for traded and non traded. Following this procedure we obtain a value for σ of .8. In the result section that would be our baseline value and we will also experiment with higher and lower values. The share parameters $a_{C,j}$, $a_{I_T,j}$ and $a_{I_N,j}$, $j = N, T, M$ are set to match the following average ratios for the interwar years for the non farm sector in Italy

Table 3. Average ratios, Italy, 1920-1940

	Symbol	Value	Symbol	Value	Symbol	Value
Import Ratios	$\frac{C_M}{M}$	.6	$\frac{I_{T,M}}{M}$	.25	$\frac{I_{T,N}}{M}$	.15
Tradable Ratios	$\frac{C_T}{Y_T}$	.55	$\frac{X}{Y_T}$	.35	$\frac{I_{T,T}+I_{N,T}}{Y_T}$	.10
Non Tradable Ratios	$\frac{C_N}{Y_N}$	.63	$\frac{I_{T,T}+I_{N,T}}{Y_N}$	.37		
Overall Ratio	$\frac{Y_N P_N}{Y_T P_T+Y_N P_N}$	.60				

In the data appendix we discuss how exactly we constructed the series to obtain these ratios.

We assume that the production technology of the two sectors have the same total factor productivity which we normalize to 1, that is, $A_N = A_T = 1$. The coefficient for capital in the production function θ is set to 0.45 which is the numbers for capital income shares reported by Vannutelli (1961) for Italy in 1938. The depreciation rate takes the value of $\delta = 0.1$.

Finally, the import tariffs. We interpret the import tariff as representative of all forms of distortions to the purchase of foreign goods, including legal restrictions as currency control and quota restrictions. Therefore, rather than calibrating τ using direct measurements of

import tariffs, we choose values of τ to obtain the observed fall in imports and exports. In the pre-depression economy $\tau = 0$.

5. Persistent shock to trade

Before describing the experiment conducted in this section, let's summarize the key facts that characterized the great depression in Italy:

(i) Large and Persistent decline in imports and exports.

(ii) Initial fall in the relative prices of tradable and non-tradable.

(iii) Large fall in hours and production in the tradable sector but smaller changes in the non-tradable sector.

(iv) Large fall in investment.

(v) Stability of the real wages. Tables 4 and 5 below quantitatively summarizes the facts above and the facts presented in the data section so they can used to evaluate the performance of the model.

Table 4. Change in Quantities in the Non Farm Sector, 1929-32

	Total	Tradable	Non Tradable
Output	-11.9%	-29%	+0.1%
Hours	-13%	-27.5%	-2.6%
Investment	-38%		
Consumption	+3.6%		
Imports	-51%		
Exports	-45%		

Table 5. Change in Prices in the Non Farm Sector, 1929-32

Relative prices of non tradables to tradables	+18.6%
Labor costs in the tradable sector	+21%
Real hourly wages	+6.6%
Real daily wages	+.5%
Nominal Wages	-8.6%
Consumer Price Index	-14.5%

The fall in international trade is probably the most striking fact of the period surrounding the great depression. For the whole 20s', foreign trade has been relatively stable until the end of the 20s' when it started a rapid and persistent decline. This motivates our interest in investigating whether the protectionist policies implemented at the end of the 20s' and during the 30's could have been an important driving force of the great depression in Italy. Studying the political reasons beyond the adoption of these protectionist policies is beyond the goal of this paper. However, there are no doubts that these policies were imple-

mented in Italy and in many other countries with deteriorating effects on international trade. To investigate the importance of these policies, we conduct a simple experiment consisting in the permanent introduction of an import tariff. We then study the reaction of the economy to the introduction of this tariff. The size of the tariff is such that the fall in imports (and exports) is about 40-45%. This was the fall in the Italian trade in the first half of the 30s'. We would like to emphasize that the tariff increase is representative of all protectionist policies, not only tariffs.

In simulating the model we consider two cases. In the first case wages are assumed to be perfectly flexible. In the second case, instead, the real wage is assumed to be fixed during the period of the depression after which it returns flexible. The tariff is introduced in 1930 and the wages are fixed from 1930 through 1938. The wage inflexibility implies that in presence of shocks the labor market may fail to clear. In this case the household first order condition determining the labor supply

$$U_2(C_t, 1 - H_t) < U_1(C_t, 1 - H_t) \cdot \bar{W}$$

is satisfied with the inequality sign (at the fixed wage rate, the marginal disutility from working is smaller than the marginal utility from consuming the wage and the worker would like to work longer).

The experiment with fixed wages is motivated by the observed constancy of the real wages observed during the depression period and by the particular wage setting situation that prevailed in Italy during Fascism (see the discussion in the data section). It is also constitutes a way of measuring the contribution of monetary shocks to the great depression, similar to the exercise conducted by Cole and Ohanian(2000) for the US economy. One can imagine

that a perfectly tuned monetary policy would have change the price level so to keep the real wage at the same level that would prevail if nominal wages were perfectly flexible. Hence the difference between the model with stick wages and the one with flexible constitute, in this class of model, an upper bound for the contribution of monetary shocks to the depression.

Figure 10 (panel (a) through panel (f))plot the impulse responses for several aggregate variables. The first thing to notice is that real wage rigidity amplifies the impact of the trade fall on the economic activity. The path of imports does not change substantially under the alternative assumptions of fixed or flexible wages. However, the response of labor and output get a significant amplification with rigid wages. Investment and consumption experience a large fall but the fall in consumption is much smother. From a quantitative point of view, the response of investment is small when compared to the fall in output. By observing panel (d) we notice that the model with flexible wages account for a decline in GDP from 1929 to 1932 of around 9% that is slightly smaller than what is observed in the data. Introducing wage rigidities can actually generate a drop in output similar to what is observed in the data. Notice also that wage rigidities, by raising the difference in labor costs in the two sectors in response to changes in relative prices, increase the difference between the behavior of the two sectors.

Figure 11 (panel (a) through panel (d)) shows the relative pattern of the two sectors. Due to the lower demand of exports, the prices of non-tradables increase relative to the tradable prices initially, after which they fall to a lower level. Panels (a) and (b) plot the responses of hours in the tradable and non-tradable sector. In both sectors hours fall but the fall is larger in the tradable sector due to the lower demand of exports. A similar pattern is observed for the production in the two sectors: panel (d) plots the production of the

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non-tradable sector relative to the production of the tradable sector.

Before summarizing the result, we conduct a sensitivity analysis with respect to the elasticity of substitution in the production of consumption and investment goods. Figure 12 (panel (a) through (d)) plot the responses of imports, investment, aggregate production and the relative production in the two sectors, for different elasticity of substitutions. The plots are constructed under the assumption that wages remained rigid during the depression. As can be seen from the plots, changes in the elasticity does not have important effects on investment and aggregate output. However, the impact on imports and sectorial composition of the economy is sensitive to the elasticity. When the inputs are more substitutable, the fall in imports and the reallocation of resources from the tradable sector to the non tradable sector are larger.

To summarize, the fall in trade had a large impact on production and hours worked. Although the responses of the model do not match exactly all behavior of the macro variables and sectorial composition observed in the data, the general pattern is consistent with the main features of the Italian depression. We therefore conclude that the trade restrictions in the 30s' played a fundamental role in the Italian depression. Quantitevely our model predict that trade alone can account for 3/4 of the observed downturn while wage rigidities (and thus in a broader sense monetary shocks) for 1/4 of the downturn.

6. Conclusion

The 1929 depression is the greatest macroeconomic shock that has affected industrialized countries in this century and its full understanding still is a challenge to economists. In this work we have analyzed the Italian economy and argued that increasing barriers to

trade together with wage rigidities might potentially explain the macroeconomic and sectorial pattern we observe in Italy. In particular we argue that the drastic fall in trade might have transformed what could have been a normal slowdown into the Great depression. That still leaves open the question why world trade collapsed in 1929. There are many potential explanations ranging from the severity of the american crisis to the international instability but that are beyond the goal of this paper. Our work though convinced that searching for these explanations is key to understanding the great depression.

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Data Appendix (TO BE COMPLETED)

The series for output, consumption, investment and hours in the non farm sector shown in figure 4 is obtained as follows.Real output in the non farm sector computed aggregating all non farm sectors from the sectoral value added data. Real Consumption is obtained by subtracting food consumption from total consumption. Investment is obtained by subtracting investment in agricolture from total investment (All original series are from Ercolani, 1978). Hours are obtained by summing total hours in the industrial sector (from Zamagni, 1994) plus total hours in the service sector (from Rossi, Sorgato and Toniolo, 1993).

The series for total factor productivity in the non farm sector in figure 5 is obtained from the following formula

$$\log(TFP_t) = \log(Y_t) - \alpha \log(K_t) - (1 - \alpha) \log(H_t)$$

where Y_t is real output in the non farm sector, K_t is net capital stock in industry and services reported in Ercolani (1978), H_t is total hours in the non farm sector. The parameter α is set to .45 to be consistent with a share of labor income of 55% in industry and services, reported by Vannutelli (1961).Non farm imports and exports ratios plotted in figure 6 are obtained by multiplying the series of nominal imports and exports from Rey(1991) by the share of non farm imports and exports[5] reported in Paradisi(1980) and then dividing the series by nominal non farm output.

The price index for tradables is constructed taking the ratio between current and constant prices gross product of the following sectors: Manifacturing, Mining and Agricolture. The price index for non tradables is computed in the same way aggregating the following

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[5]The share for non farm import and exports is reported only for the years 1922,1926,1929,1932,1936,1938. For the reamining years we have used linear interpolation.

sectors: Construction, Electricity Gas and Water, Transportation, Commerce, Credit and Insurance, Various Services, Building Services.The source for the original data is Ercolani (1978) The ratio of these two prices is reported in figure 7 The graph of figure 7 is robust to different definitions of tradables and non tradables and in particular to the inclusion or exclusion of agricolture in the tradable sector or to the inclusion or exclusion of public administration in the non tradable sector. . The data in figure ?? are constructed as follows. For nominal wages in the tradable sector we use industrial hourly wages reported by Zamagni(1994). For nominal wage in the non tradable sector we use the hourly nominal wages in the service sector reported by Rossi, Sorgato and Toniolo(1993) . Real wages in the two sectors (tradables and non tradables) are obtained by dividing the nominal wage series by the price index for two sectors. For total hours worked in the tradable sector we use total hours in industry reported by Zamagni(1994). For total hours in the non tradable we used hours in the service sector reported by Rossi Sorgato and Toniolo(1993). The data in figure 9 are constructed as follows. Real Hourly wages are nominal hourly wages in industry reported by Zamagni(1994), deflated by CPI (Reported also by Zamagni, 1994). Daily real wages is real hourly wahes times the average hours worked per day, in Zamagni(1994).
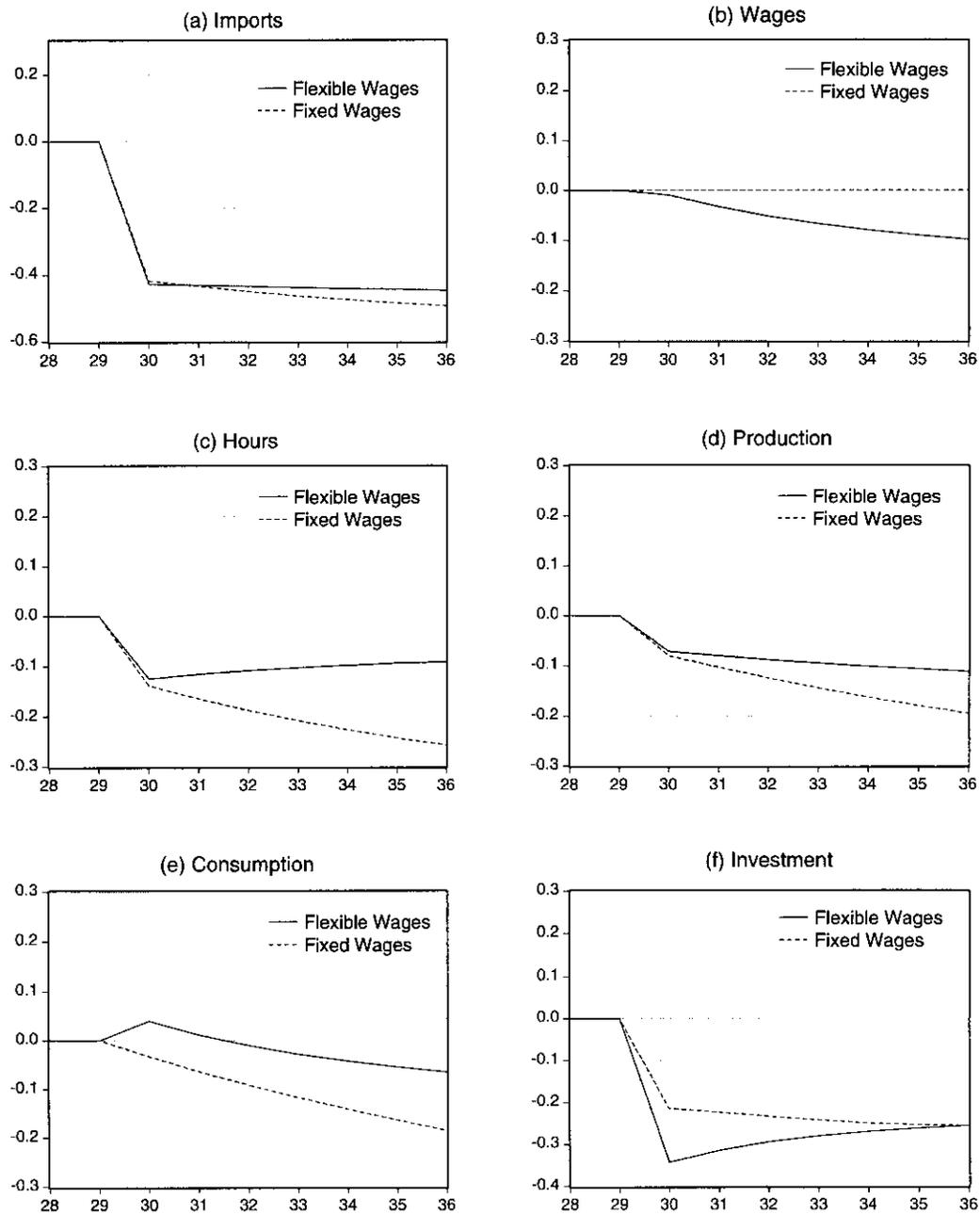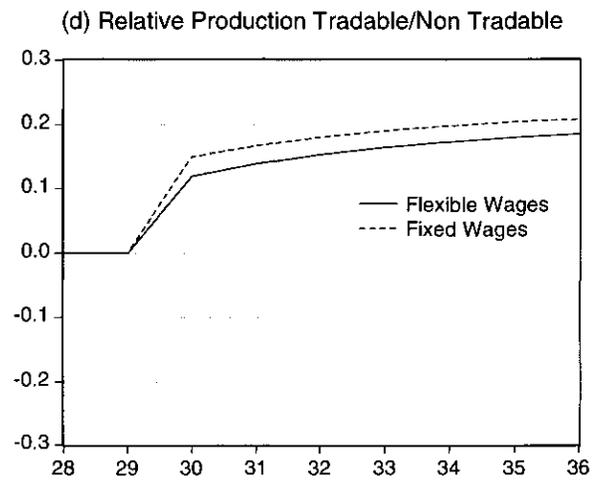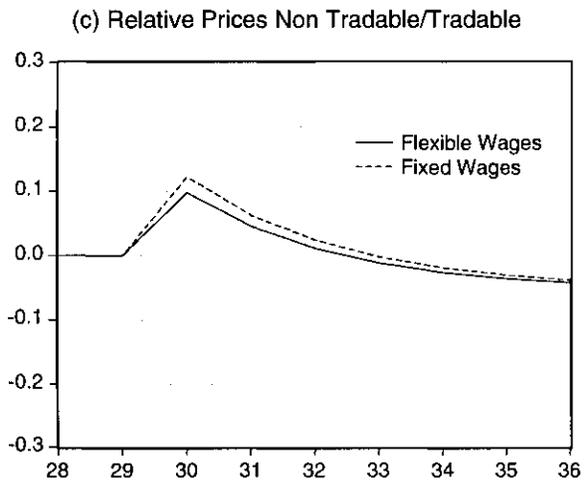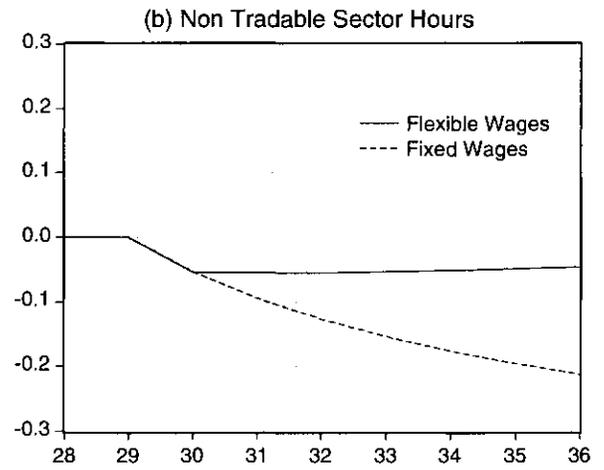
Figure 10:

Figure 11:

Figure 12: