The Great Depression in Italy: Trade Restrictions and Real Wage Rigidities*

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Running Head: Italian Great Depression

Abstract

In Italy, as in many other countries, the years immediately after 1929 were characterized by a major slowdown in economic activity. We argue that the depth and duration of the crisis cannot be explained solely by productivity shocks. We present a model in which trade restrictions together with wage rigidities produce a significant slowdown in economic activity. The model is also consistent with evidence from sectoral disaggregated data. Our model predicts that trade restrictions can account for about one-half of the slowdown observed in the data while real wage rigidities can account for one-fourth of it.

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1 INTRODUCTION

The economic recession experienced by many countries at the end of the 1920s and at the beginning of the 1930s—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 Depression in Italy were not very different from those of more industrialized countries like England, France and the United States. Although the fall in aggregate production was smaller, the contraction in industrial production was as severe as in more industrialized countries. More broadly, the key features of the Italian Depression can be summarized as follows:

(i) Persistent decline in international trade.

(ii) Large fall in hours worked and production in the tradable sector, but negligible changes in the nontradable sector.

(iii) Large fall in investment.

(iv) Stability of the real wages.

A striking aspect of the Great Depression is that it involved many countries during the same period of time. This consideration leads us to investigate mechanisms of international transmission. Among these mechanisms, the fall in international trade con-

stitutes 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 1920s. These policies took several forms such as 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 Italy? In this paper we claim that the drop in international trade was a major cause of the 1930s economic downturn in Italy, and the downturn was amplified by the rigidity of the *real* wages.

We develop an open-economy model with two sectors of production: the tradable sector and the nontradable sector. The tradable and nontradable productions are then combined to produce consumption and investment in the two sectors. 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 1920s and 1930s, where a significant share of nonfarm imports were investment goods for the industrial sector. This dependence on the import of investment goods—which derives from the lower development of the industrial sector in Italy—was an important mechanism of transmission of the international economic crisis in Italy. Using a calibrated version of the model, we show that the contraction in the foreign trade can account

for features (ii) and (iii) of the Italian Depression listed above. The role played by the stability of the real wages (iv) has been to amplify the consequences of the trade contraction. Our work is related to and has been inspired by the papers of Cole and Ohanian (1999 and 2001), who analyzed the Great Depression in the United States. Few authors have analyzed the Great Depression in Italy but none (to our knowledge) has done it using an explicit macroeconomic model.[1]

2 THE ITALIAN ECONOMY IN THE INTERWAR YEARS

In this section we present some basic facts about the Italian economy in the interwar years. We first compare the performance of the Italian economy to the performance of other countries in terms of per capita GDP, industrial production and international trade. We then document the pattern of other aggregate and sectoral disaggregated data more specifically for Italy.

2.1 Italy in the international context

Figures 1 and 2 plot the detrended[2]patterns of per capita GDP and per capita industrial production during the Depression, while table I presents simple measures of depth

(peak to trough percentage drop) and persistence (years needed to reach back the 1929 level). The data clearly show that Italy experienced a major and persistent slowdown in GDP growth, although less severe than some other countries, and a significant and persistent drop in industrial production.[3]The graphs and the table also show that: (i) the Great Depression involved many countries in a synchronous way; and (ii) the size and persistence of the drop in industrial production has been bigger than for GDP.

FIGURES 1 AND 2 APPROXIMATELY HERE

Table I about here

The fact that the Great Depression was so synchronous across countries suggests that common factors may be important explanations for the Depression. One possible candidate is the contraction of trade in the interwar years. Table II 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 this period. A more direct indication of trade restrictions are the tariff increases in the late 1920s and early 1930s. Crucini and Kahn (1996) report that average ad valorem tariffs in a sample of industrialized countries raised from 9.9 percent in 1920-1929 to 19.9 percent in 1930-1940. For Italy the increase in the same period was from 4.5 percent to 16.8 percent.

Increased tariffs, however, were only part of the increasingly protectionist policies. For Italy, a set of rules and regulations was introduced in the late 1920s and early 1930s[4]that explicitly attempted to reduce imports. Examples of these rules include the requirement that Italian products had 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 exchange controls. For a more extensive list of import restrictions, see Guarneri (1988), Chapter 7. The introduction of these protectionist policies leads us to investigate the extent to which these policies can account for the economic downturn of the Italian economy during the first half of the 1930's.[5]

Table II about here

2.2 Performance of the nonfarm sector

One of the reasons why the drop in GDP during the Depression was smaller in Italy than in other countries is because Italy was characterized by a larger agricultural sector. Figure 3 reports the sectoral decomposition of GDP and shows that agricultural production was large (its contribution to GDP was about 40 percent) but relatively unaffected by the Depression. Although there was a drop in agricultural output from 1929 to 1930, the size of the decline was not different from previous and successive

declines. Also, in 1930 and 1931, agricultural production experienced positive growth unlike the other two sectors.

FIGURE 3 APPROXIMATELY HERE

Because agricultural production was not affected in important ways by the Great Depression, in the remaining part of the paper we will concentrate our analysis on the nonfarm sector. Figure 4 plots a measure of detrended total factor productivity in the nonfarm sector. It is important to note that the size and persistence of the observed productivity drop during the Depression were not significantly bigger than those observed in other interwar contractions (not shown in the figure). In line with the findings of Cole and Ohanian (1999) for the United States, Figure 4 suggests that although technology shocks may have played a role in the first part of the recession, these shocks cannot account for the persistence of the Great Depression. In fact, the level of productivity is very low only in 1931 and 1932 while per-capita GDP is still below trend at the end of the 1930s despite the subsequent productivity improvements.

Therefore, other factors must have played a role. As we already mentioned, the contraction of trade might be one of these factors. Figure 5 plots the ratio of nonfarm exports and imports to GDP in Italy from 1929 to 1938 and shows that these ratios experienced a large and rapid decline during the period of the Depression and remained low in succes-

sive years. In contrast, throughout the 1920s, these ratios were roughly constant (around 21 percent). Accordingly, we will focus our analysis on the effects of Trade restrictions and ask whether they can account for the Italian Depression.

FIGURES 4 AND 5 APPROXIMATELY HERE

Finally, Figure 6 shows the patterns of per capita nonfarm real consumption, per capita nonfarm real investment, output and total hours worked in the Depression. Each series is detrended linearly. To estimate the trend, we follow Cole and Ohanian (1999), who use data in the pre-Depression and postwar periods. In particular, we use data for the 1920-1929 and 1951-1990 periods. Notice that while consumption is marginally affected by the Great Depression, the fall in investment is very severe and prolonged. Hours and output also fall by more than 10 percent and they are still below the long-run trend in 1938.

FIGURE 6 APPROXIMATELY HERE

2.3 Relative prices, wages and other sectoral evidence

In the model presented in the next section, we show that trade restrictions can have a substantial impact on production by increasing the cost of foreign inputs used in

production and by reducing demand for domestic tradables. Another important effect of trade restrictions is that they reduce the demand for domestic tradables (given the reduction in exports), with a consequent fall in their relative prices. This, in turn, may result in a shift of resources from the tradable sector to the nontradable sector. In this section we document pattern for prices, wages and production in the two sectors observed in Italy during the Depression period.

Figure 7 shows that the price of nonfarm tradable goods (manufacturing plus mining with or without agricultural goods) fell rapidly relatively to the price of nontradable goods (construction and services). Our theoretical hypothesis is that trade restrictions were causing both the decline in exports and imports (displayed in Figure 5) and the increase in the relative price of nontradables (displayed in Figure 7).

FIGURE 7 APPROXIMATELY HERE

Figure 8 shows real wages and the pattern of hours worked in the two production sectors. In this figure we use real wages as a measure of the relative labor costs. For this reason, they are deflated by the price index of the sector in which they are paid. It is important to point out that almost all the difference in the pattern of real wages can be attributed to the pattern of the relative prices. In fact, there is very little difference between the series for nominal wages in the two sectors. Notice also that

during the Depression, a sharp and persistent increase in real wages in the tradable sector was associated with a large and persistent decline in total hours. The strong negative correlation between real wages and total hours seems to indicate that the reduction in hours worked was 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 real wage rigidity.

Some economists (see for example Bernanke and Carey (1996)) have 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 due to the particular political situation. The fascist regime was able to set the nominal wage through the corporations system, and there was surprisingly little worker resistance to nominal wages cuts.[6]After the 1929 crisis hit, it appears that the deliberate nominal wage 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, a progressive reduction of the workday was implemented in the labor contracts. These two policies together meant that although the real (CPI deflated) daily wage was kept constant, the real (CPI deflated) hourly wage increased. Figure 9 documents the patterns for nominal hourly wages, hourly and daily real wages, and shows that even though the daily wage was fairly constant, the real hourly wage increased

by about 20 percent. This pattern together with the behavior of the relative price of tradables caused, as seen in Figure 8, an increase in the labor costs in the tradable sector of more than 20 percent.

FIGURES 8 and 9 APPROXIMATELY HERE

3 THE MODEL

In this section we present a model of the Italian economy during the interwar years. The economy is a two-sector open-economy model populated by a continuum of households that maximize the lifetime utility:

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

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: consumption goods produced in the nontradable 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:

$$\begin{aligned} C &= \Phi(C_N, C_T, C_M) \\ &= \left[a_C \cdot C_N^{\frac{\sigma-1}{\sigma}} + (1 - a_C) \cdot \left(b_C \cdot C_T^{\frac{\epsilon-1}{\epsilon}} + (1 - b_C) \cdot C_M^{\frac{\epsilon-1}{\epsilon}} \right)^{\frac{\epsilon(\sigma-1)}{(\epsilon-1)\sigma}} \right]^{\frac{\sigma}{\sigma-1}} \end{aligned} \tag{2}$$

The parameter σ is the elasticity of substitution between the consumption input produced in the nontradable sector and a composite input of tradable goods produced domestically and abroad. The elasticity of substitution between the domestic tradable input and the foreign input is ϵ. The parameters a_C and b_C will determine the shares of the three inputs.

The production of nontradable and tradable goods takes place according to the following constant return-to-scale technologies:

$$Y_i = A_i K_i^{\theta} H_i^{1-\theta}, \qquad i = N, T \tag{3}$$

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

$$\begin{aligned} I_N &= \Phi^N(I_{N,N}, I_{N,T}, I_{N,M}) \qquad (4) \\ &= \left[a_{I_N} \cdot I_{N,N}^{\frac{\sigma-1}{\sigma}} + (1 - a_{I_N}) \cdot \left(b_{I_N} \cdot I_{N,T}^{\frac{\epsilon-1}{\epsilon}} + (1 - b_{I_N}) \cdot I_{N,M}^{\frac{\epsilon-1}{\epsilon}} \right)^{\frac{\epsilon(\sigma-1)}{(\epsilon-1)\sigma}} \right]^{\frac{\sigma}{\sigma-1}} \\ I_T &= \Phi^T(I_{T,N}, I_{T,T}, I_{T,M}) \qquad (5) \\ &= \left[a_{I_T} \cdot I_{T,N}^{\frac{\sigma-1}{\sigma}} + (1 - a_{I_T}) \cdot \left(b_{I_T} \cdot I_{T,T}^{\frac{\epsilon-1}{\epsilon}} + (1 - b_{I_T}) \cdot I_{T,M}^{\frac{\epsilon-1}{\epsilon}} \right)^{\frac{\epsilon(\sigma-1)}{(\epsilon-1)\sigma}} \right]^{\frac{\sigma}{\sigma-1}} \end{aligned}$$

where $I_{i,j}$ is the intermediate input used to produce investment in sector $i = N, T$, and produced in sector $j = N, T, M$. The parameters a_{I_i} and b_{I_i} will determine the share of

the intermediate inputs. The elasticities between nontradable and tradable inputs, and between domestic and foreign tradable inputs are restricted to be equal to the elasticities of the consumption aggregator.

The resource constraints are:

$$Y_N = C_N + I_{N,N} + I_{T,N} \tag{6}$$

$$Y_T = C_T + I_{N,T} + I_{T,T} + X \tag{7}$$

$$M = C_M + I_{N,M} + I_{T,M} \tag{8}$$

where C_N, C_T, C_M are the domestic consumption of nontradables, tradables and imports; $I_{i,T},\ I_{i,N}, I_{i,M}$ are the intermediate inputs of nontradables, tradables and imports used in the production of investment in sector $i = N, T$; X are the tradable goods exported abroad and M are the total imports.

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

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

We assume that there is not international mobility of capital.[7]The equilibrium in the foreign sector is then given by the balance in the trade account, that is:

$$P_{M,t} \cdot M_t = P_{T,t} X_t \tag{10}$$

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 restriction 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 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 $\tau_t M_t P_{M,t}$

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:

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

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:

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

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

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

$$W \cdot H + R_N K_N + R_T K_T + T = (C_N + I_{N,N} + I_{T,N}) P_N + \tag{14}$$
$$(C_T + I_{T,T} + I_{N,T}) P_T + (C_M + I_{T,M} + I_{N,M}) P_M (1+\tau)$$

and to the technological constraints (2), (4), (5) and (9). Given the sequence of 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 first-order conditions for households and firms, along with the proper transversality conditions, determine the equilibrium of the economy.

4 CALIBRATION

We want to interpret the model representative of the Italian nonfarm sector in the interwar period. Therefore, we calibrate the model on an annual basis using data from the nonfarm sector during that period. The utility function is specified as $U(C_t, 1-H_t) = \alpha \log(C_t) + (1-\alpha)\log(1-H_t)$, with $\alpha = 0.33$. The intertemporal discount rate is set to $\beta = 0.96$, which is consistent with an average growth rate of consumption of 1.3 percent and with an average real risk free rate (rate on government bonds) of 6.2 percent computed for Italy in the period 1920-1940 (the data are from Ercolani, 1978).

Two important parameters are the elasticities of substitution between tradables and nontradables, σ, and between domestic and foreign tradables, ϵ. Unfortunately, we do not have enough disaggregated data to estimate the two 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 forms of barriers that are not reflected in the measures we have of international prices. Therefore, we estimate the elasticity between tradables and nontradables directly; but for the elasticity of substitution between domestic and foreign tradables we use values recently used in the literature. To estimate σ we use the first-order conditions for tradable and nontradable consumption. Taking the standard deviation of the log of the ratio of

these first-order conditions we obtain:

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

Therefore, the elasticity σ can be obtained taking the ratio of the standard deviations of relative consumption and relative prices of tradables and nontradables. Following this procedure we estimate $\sigma = 0.8$. This value is not very far from the value of 0.5 used by Stockman and Tesar (1995). Following Backus, Kehoe and Kydland (1994) and other studies in international business cycles we set ϵ, the elasticity of substitution between domestic and foreign tradables, equal to 1.5.

The share parameters $a_C, b_C, a_{I_N}, b_{I_N}, a_{I_T}, b_{I_T}$ are set to match the input-output ratios for the nonfarm sector during the interwar years, as reported in Table III. The construction of these ratios is described in the Data Appendix. These ratios provide eight conditions but only five are independent. Therefore, to pin down the six share parameters we need an extra condition. This extra condition could be given by the ratio between the tradable inputs in the production of investment in the tradable and nontradable sectors, that is, $I_{T,T}/I_{N,T}$. Because we do not have data to measure this ratio directly, we simply set this ratio equal to 1. However, the results are not significantly sensitive to this ratio.

Table III about here

We assume that the production technologies of the two sectors have the same total factor productivity, which we normalize to 1, that is, $A_N = A_T = 1$. There is no growth in productivity in the model, so the series generated from the model should be interpreted as deviations from a balanced growth path. The parameter θ is set to 0.45, which is the value of the capital income share reported by Vannutelli (1961) for Italy in 1938. The depreciation rate is assigned the value of $\delta = 0.1$.

Finally, the import tariffs. In the model the import tariff is interpreted as representative of all forms of distortions to the purchase of foreign imports. This includes legal restrictions such as currency control and quota limitations. Therefore, rather than calibrating τ using direct measurements of import tariffs, we choose values of τ that generate the observed fall of imports and exports during the recession. Starting from $\tau = 0$ in the pre-depression economy, the desired fall in trade requires a new value of τ equal to 0.5. As observed previously, the increase in measured tariffs has been smaller than 50 percent. However, this higher value should be interpreted as accounting for all forms of trade restrictions. Once we take this broader interpretation of the tariff increase, the number is not unreasonable.

5 A PERSISTENT SHOCK TO TRADE

Before describing the experiment conducted in this section, we recap the key facts that characterized the Great Depression in Italy:

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

(ii) Large fall in hours and production in the tradable sector but smaller changes in the nontradable sector.

(iii) Large fall in investment.

(iv) Stability of the real wages.

The facts are quantitatively summarizes by Table IV and will be used as a reference to evaluate the performance of the model.

Table IV about here

The fall in international trade is probably the most striking aspect of the period surrounding the Great Depression. Foreign trade was relatively stable until the end of the 1920s, when it started a rapid and persistent decline. This motivates our interest in investigating whether the protectionist policies implemented at the end of the 1920s and during the 1930s could have been an important driving force of the Great Depression in

Italy. Studying the political forces motivating the adoption of these policies is beyond the scope of this paper. However, there is no doubt that these policies were implemented in Italy and in many other countries with detrimental effects on international trade. To investigate the importance of these policies, we conduct a simple experiment: starting from the steady state in which $\tau = 0$, we consider the unexpected and 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 percent, comparable to the fall in the Italian trade in the first half of the 1930s.

In simulating the model, we consider two cases. In the first case wages are assumed to be perfectly flexible. In the second case, the real wage is assumed to be fixed during the period of the depression, after which it becomes flexible. The tariff is introduced in 1930 and the wages are fixed from 1930 through 1938. The wage inflexibility implies that after the tariff increase, the labor market fails to clear. In this case the household first-order condition determining the labor supply is satisfied with the inequality sign, that is:

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

This simply means that 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 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 U.S. economy. One can imagine that a perfectly tuned monetary policy would have changed the price level to keep the real wage at the same level that would have prevailed if nominal wages were perfectly flexible. Hence the difference between the model with sticky wages and the model with flexible wages can be interpreted as the upper bound for the contribution of monetary shocks to the Depression.

Figure 10 (panel (a) through panel (f)) plots the impulse responses for several aggregate variables. The solid line represents the response of the economy with flexible wages, while the dashed line represents the response of the economy with fixed real wages. The first point to note is that the introduction of the tariff substantially reduces output in both cases (see panel d). To understand this, we have to keep in mind that a tariff increases the cost of a necessary input of production (foreign tradables) and at the same time, due to the assumption of no international borrowing and lending, lowers the demand for domestic tradables: both of these forces cause a reduction in output.

Notice also that the impact of the trade fall on the responses of labor and output are amplified by the real wage rigidity. Investment and consumption also fall, but the fall in consumption is much smaller. Finally, notice that the model predicts a persistent decline in all variables (for example, after nine years investment is still 18 percent below its long-run trend, and that is consistent with Figure 6).

FIGURE 10 APPROXIMATELY HERE

From a quantitative point of view, panel (d) shows that the model with flexible wages accounts for a decline in GDP from 1929 to 1932 of around 5.5 percent that is about one-half of that observed in the data. Introducing wage rigidities can generate a drop in output of about 8 percent which is three-fourths of what is observed in the data. Notice also that the extent of the fall in hours is similar to the data (in the case of fixed wages), while the fall in investment in the model is smaller than in the data (in both fixed and flexible wages).

Notice that, due to wage rigidities and changes in relative prices between the tradable and nontradable sectors, wage rigidity differently affects the labor costs in the two sectors. This, in turn, impacts the relative performance of the two production sectors. This performance is illustrated in Figure 11 (panel (a) through panel (d)). Due to the lower demand for exports, the prices of nontradables increase relative to the prices of tradables

initially, after which they fall to a lower level. This pattern is qualitatively consistent with the evidence presented in Figure 7 even though the change in relative prices in the data is bigger. Panels (a) and (b) show that in both sectors hours fall. However, the drop is larger in the tradable sector due to the lower demand for exports. A similar pattern is observed for the production in the two sectors: panel (d) plots the production of nontradables relative to the production of tradables. Again, this sectoral pattern is qualitatively consistent with the data even though the differences in the responses of the two sectors is sharper in the data.

FIGURE 11 APPROXIMATELY HERE

These results suggest that the fall in trade had a large impact on production and hours worked. Although the responses of the model do not exactly match all the behaviors of the macro variables and sectoral composition observed in the data, the general pattern is consistent with the main features of the Italian depression. Therefore, we conclude that the trade restrictions introduced in the late 1920s and early 1930s had a significant impact on the Italian economy and were an important factor for the Great Depression in Italy. Quantitatively, our model predicts that trade alone can account for one-half of the observed downturn, while real wage rigidities (and thus in a broader sense, monetary shocks) account for one-quarter of the downturn.

To some extent, however, these results depend on the calibration of the elasticities of substitution among consumption and investment inputs. An important parameter is the elasticity of substitution between domestic and foreign tradables. We have experimented with lower and higher values of this elasticity; the main result is that lower values would yield larger output drops while higher values would yield lower output drops. In the model with wage rigidities, an elasticity of 1, as in Stockman and Tesar (1995), enables the model to generate a drop in output as large as in the data. A value of 2 generates half of the output drop observed in the data.[8]A more complex model would be one in which the elasticity is allowed to vary over time, being low in the short run and high in the long run. We suspect that this model would probably generate a large response on impact, but a less persistent effect after the introduction of tariffs.

6 CONCLUSION

The Great depression is the greatest macroeconomic shock to hit industrialized countries in this century, and its full understanding is still a challenge to economists. The simultaneous impact of the Depression on so many countries led us to investigate whether some mechanism of international transmission spread the affliction. More specifically, we investigated the extent to which the fall in international trade was responsible for the economic depression in Italy. Our results suggest that increasing barriers to trade,

together with real wage rigidities, can explain a large proportion of the economic downturn experienced by Italy at the beginning of the 1930s. Given this result, it would be interesting to investigate whether the same mechanism could explain the recession experience of other countries during the same period. In particular, we question whether the failure to maintain an international environment of free trade could have been the main cause of the worldwide diffusion of the Great Depression. We leave this and other related questions for future research.

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Data Appendix

The data for Figure 1 are from Maddison (1991).

The data for Figure 2 are from OECC (1958).

The data for Figure 3 are from Ercolani (1978).

The series for total factor productivity in the nonfarm sector in Figure 4 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 nonfarm sector, K_t is net capital stock in industry and services reported by Ercolani (1978), H_t is total hours in the nonfarm sector. The parameter α is set to .45 to be consistent with a share of labor income of 55 percent in industry and services, reported by Vannutelli (1961). This series is then detrended by $1.02^{1-\theta}$, which is approximately equal to 1.01.

Nonfarm imports and exports ratios plotted in Figure 5 are obtained by multiplying the series of nominal imports and exports from Rey (1991) by the share of nonfarm imports and exports[9]reported in Paradisi (1980) and then dividing the series by nominal nonfarm output (obtained from Rey (1991) subtracting agricultural output from total output).

The series for per capita output, consumption, investment and hours in the nonfarm sector shown in Figure 6 are obtained as follows: real output in the nonfarm sector

is computed by aggregating all nonfarm 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 agriculture 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)). All series are divided by midyear population estimates (from Rey, 1991).

The relative prices reported in Figure 7 are the ratio of nontradable prices to tradable prices (with and without agricultural prices). The price indexes for tradables is constructed taking the ratio between current and constant prices gross product of Manufacturing and Mining with and without Agriculture. The price index for nontradables is computed in the same way aggregating the following 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 data in Figure 8 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 nontradable 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 nontradables) are obtained by dividing the nominal wage series by the price index for

the 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 nontradable we use 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 wages times the average hours worked per day, in Zamagni (1994).

The ratios in Table III are constructed as follows: For the nontradable ratios we construct a series for nontradable consumption (C_N) adding consumption of housing, transportation, health, education and entertainment plus 50 percent of other goods and services. (Consumption series are from Rossi, Sorgato and Toniolo (1993)). We then construct a series for nontradable output (Y_N) adding output of Construction, Electricity Gas and Water, Transportation, Commerce, Credit and Insurance, Various Services, Building Services (from Ercolani (1978)).

For the tradable ratios we construct a series for nonfarm tradable consumption (C_T), adding consumption of clothing, furniture, fuels plus 50 percent other goods and services (Consumption series are from Rossi, Sorgato and Toniolo (1993)). We construct a series for nonfarm tradable output (Y_T) adding output from manufacturing and mining (from Ercolani (1978)) and a series for nonfarm export (X). (See the description for the data

in Figure 5). Finally we use data reported by Paradisi (1980), table 2A, to disaggregate nonfarm imports into three categories. We identify imports of textile products, wood and rubber as imports of consumption goods (C_M), we identify imports of construction materials as import of investment goods for the nontradable sector ($I_{N,M}$) and we identify the remaining nonfarm imports as imports of investment goods for the tradable sector ($I_{T,M}$). The ratios reported in the table are derived from taking average of the series just described in the period 1920-1940.

1 A recent contribution is the work by Mattesini and Quintieri (1997) while Piva and Toniolo (1993) have a very interesting work on the Italian labor markets during the Great Depression.

2 The deviations from trend are obtained assuming a common long run growth trend.of 2% per year (as in most other papers in this volume) and that all the economies were on trend in 1929.

3 To get a feeling for the magnitude of the depression it might be useful to compare the 1929 contraction in the United States to the 1973 contraction, the sharpest in the U.S. postwar period. In the decline that started in 1973 GDP per capita contracted 2.6% and took 3 years to go back to the 1973 level while industrial production per capita fell by 11.7% and took 4 years to return to the 1973 level.

4 The turning point in the Italian trade policy was the nomination in 1925 of the Finance minister Volpi who abandoned the previous liberist trade policy to adopt a series of protectionist measures in order to restore the gold convertibility of the lira (the quota 90 policy). After convertibility was restored (end of 1927) a series of international trade sanctions were imposed on Italy because of the Italian invasion of Ethiopia. In response to the sanctions, Italy adopted an even more strict protectionist policy and by the early 1930s, after the *sovra-dazio* (extra-tariff) of 1931, "autarky" was the explicit goal of the fascist trade policy.

5 Ciocca (1976) noticed the importance of the collapse in world trade for the Italian economy suggesting that "The repercussions of this phenomenon [the collapse of world trade] for the Italian economy are yet to be quantified but they cannot be unimportant for a transforming country in which the lack and deficiency of primary resources is a fundamental characteristic."

6 Salvemini (1938, p.363) reports 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."

7 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.)

8 Complete results of the sensitivity experiments are available from the authors upon request.

9 The share for nonfarm import and exports is reported only for the years 1922, 1926, 1929, 1932, 1936, and 1938. For the remaining years we have used linear interpolation.

Table I

Decline from peak to trough and

years to return to 1929 level.

	GDP		Industrial Production	
	Decline	Years	Decline	Years
United States	31.8%	>10	46.5%	>10
France	15.9%	8	26.7%	>10
Germany	17.8%	6	41.9%	7
Italy	7.0%	6	24.5%	8
United Kingdom	6.7%	5	14.7%	5

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

Table II

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)

Table III

Average ratios, Italy, 1920-1940.

Non Tradable Ratios	$\frac{C_N}{Y_N} = .63$	$\frac{I_{N,N}+I_{T,N}}{Y_N} = .37$	
Tradable Ratios	$\frac{C_T}{Y_T} = .55$	$\frac{I_{N,T}+I_{T,T}}{Y_T} = .10$	$\frac{X}{Y_T} = .35$
Import Ratios	$\frac{C_M}{M} = .60$	$\frac{I_{N,M}}{M} = .15$	$\frac{I_{T,M}}{M} = .25$

Table IV

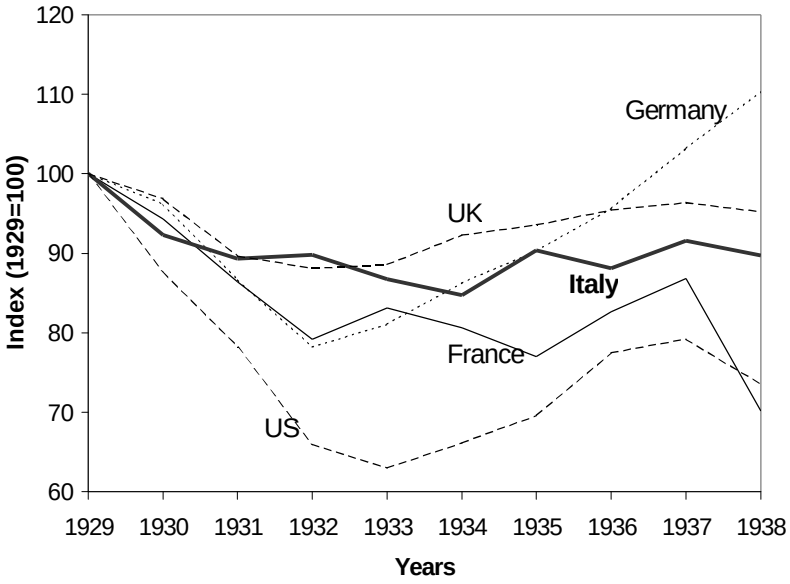
Summary statistics of the great depression in Italy.

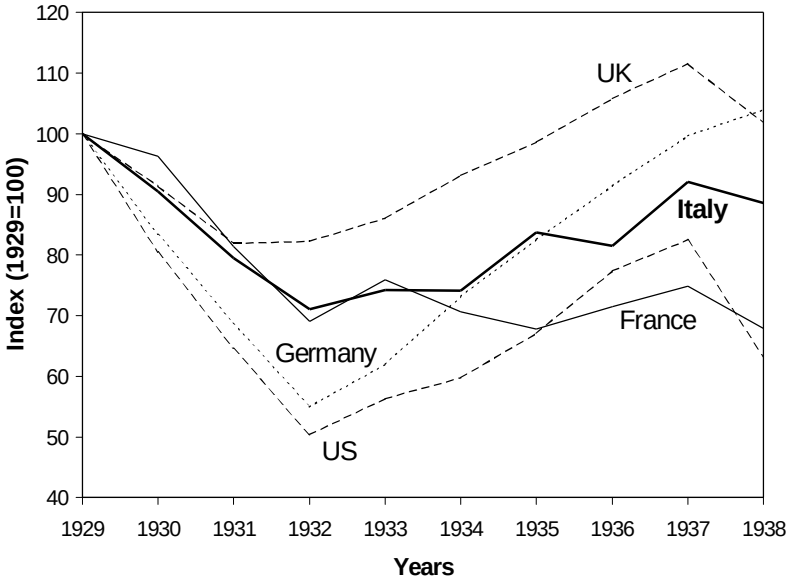
a) Change in Quantities in the Non-Farm Sector, 1929-32.

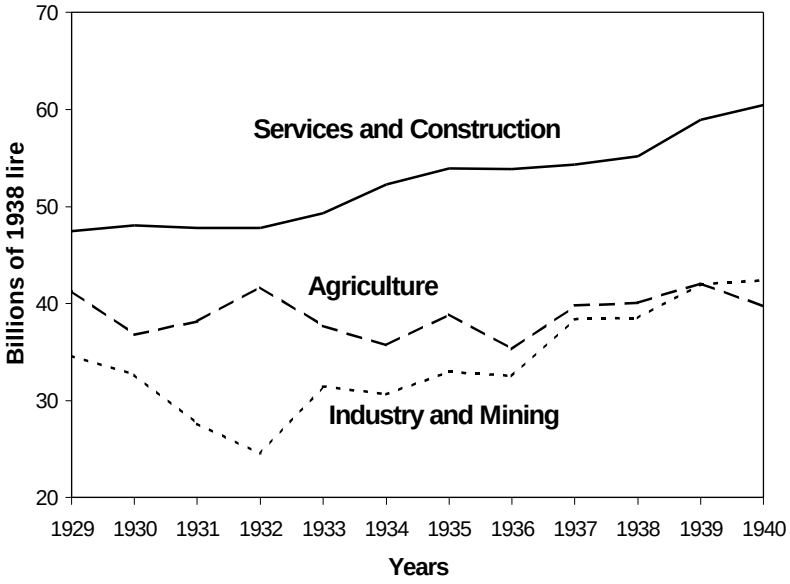
	Total	Tradable	Non-Trade
Output	-11.9%	-29.0%	0.1%
Hours	-13.0%	-27.5%	-2.6%
Investment	-38.0%		
Consumption	3.6%		
Imports	-51.0%		
Exports	-45.0%		

b) Change in Prices in the Non-Farm Sector, 1929-32.

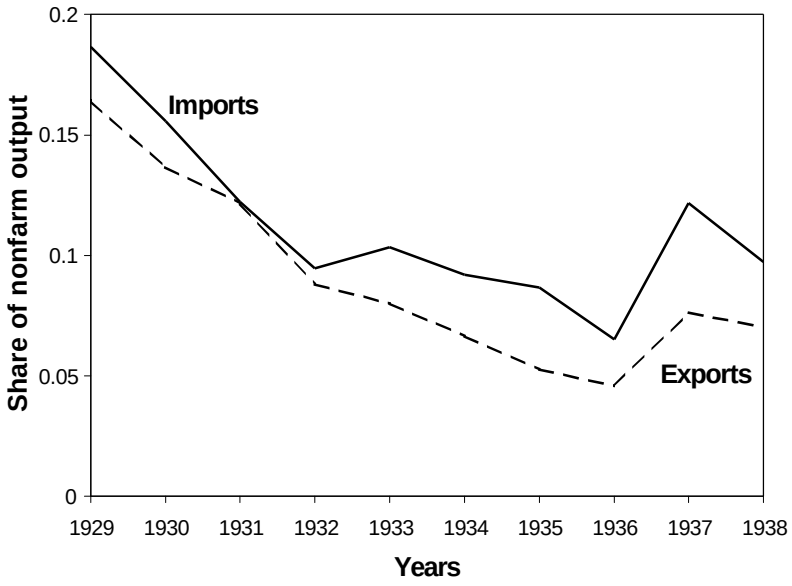
Relative prices non-tradables/tradables	18.6%
Labor costs in the tradable sector	21.0%
Real hourly wages	6.6%
Real daily wages	0.5%
Nominal Wages	-8.6%
Consumer Price Index	-14.5%


120
110
100
90
80
70
60
Index (1929=100)
1929
1930
1931
1932
1933
1934
1935
1936
1937
1938
Years
Germany
UK
Italy
France
US

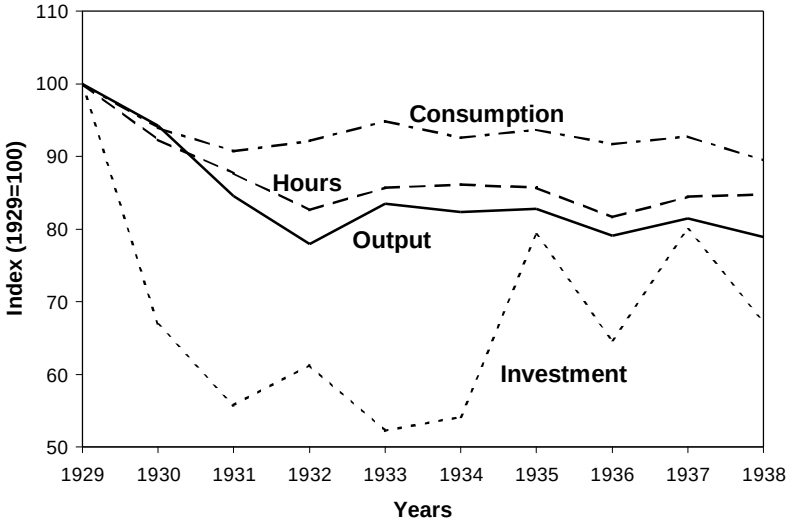

120
110
100
90
80
70
60
50
40
Index (1929=100)
1929
1930
1931
1932
1933
1934
1935
1936
1937
1938
Years
UK
Italy
France
Germany
US

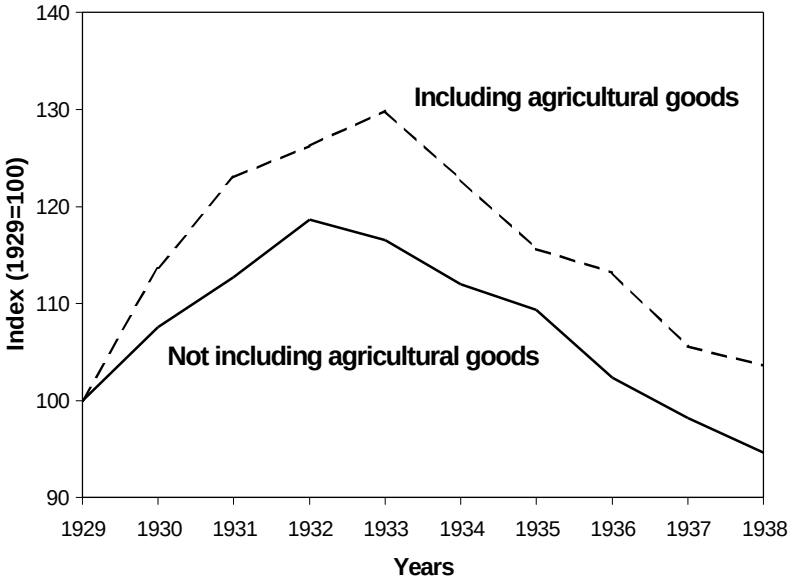

70
60
50
40
30
20
Billions of 1938 lire
Services and Construction
Agriculture
Industry and Mining
1929
1930
1931
1932
1933
1934
1935
1936
1937
1938
1939
1940
Years

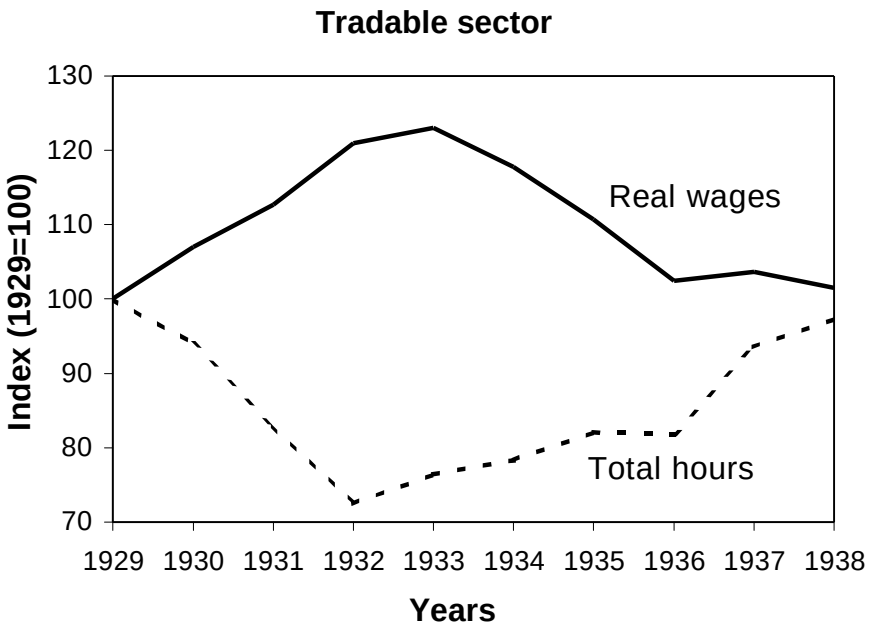

105
100
95
90
Index (1929=100)
1929
1930
1931
1932
1933
1934
1935
1936
1937
1938
Years

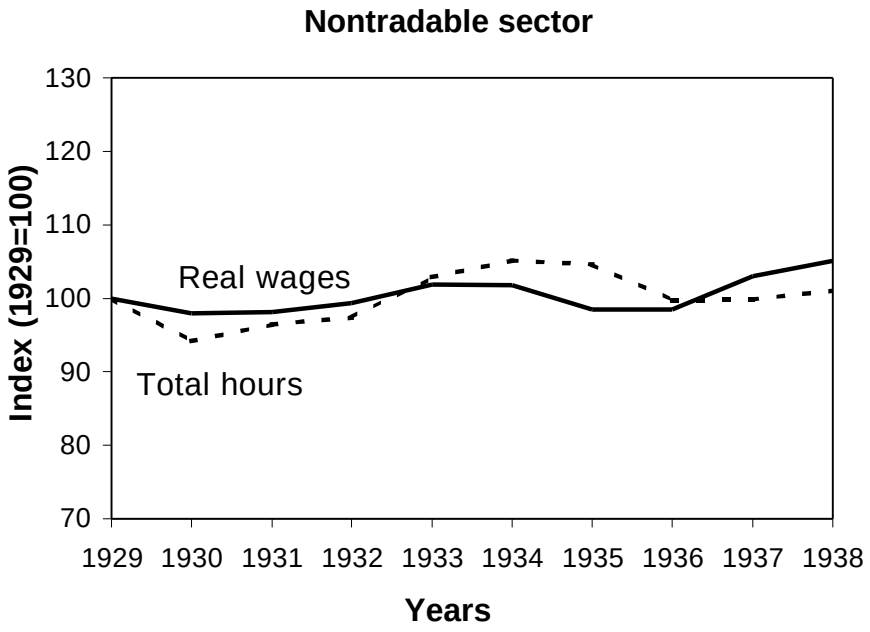

0.2
0.15
0.1
0.05
0
Share of nonfarm output
Imports
Exports
1929
1930
1931
1932
1933
1934
1935
1936
1937
1938
Years

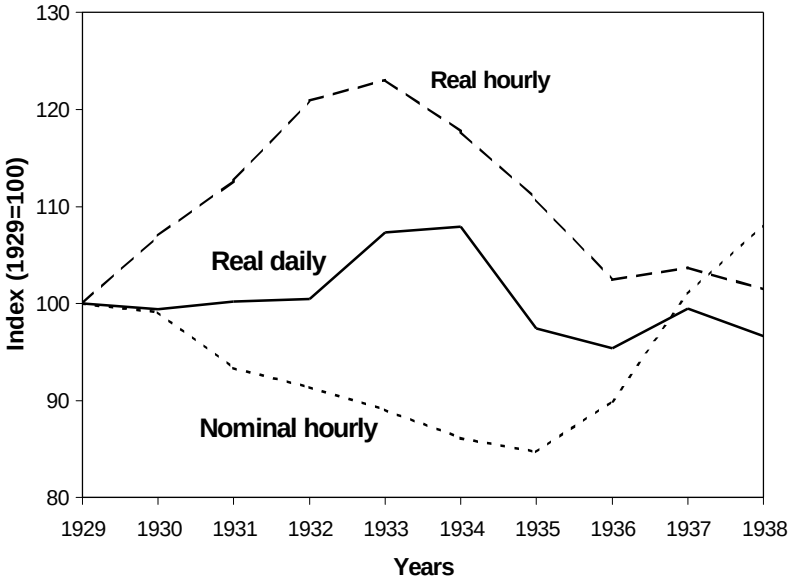
Review of Economic Dynamics
Perri, F. and Quadrini, V.
FIG. 6

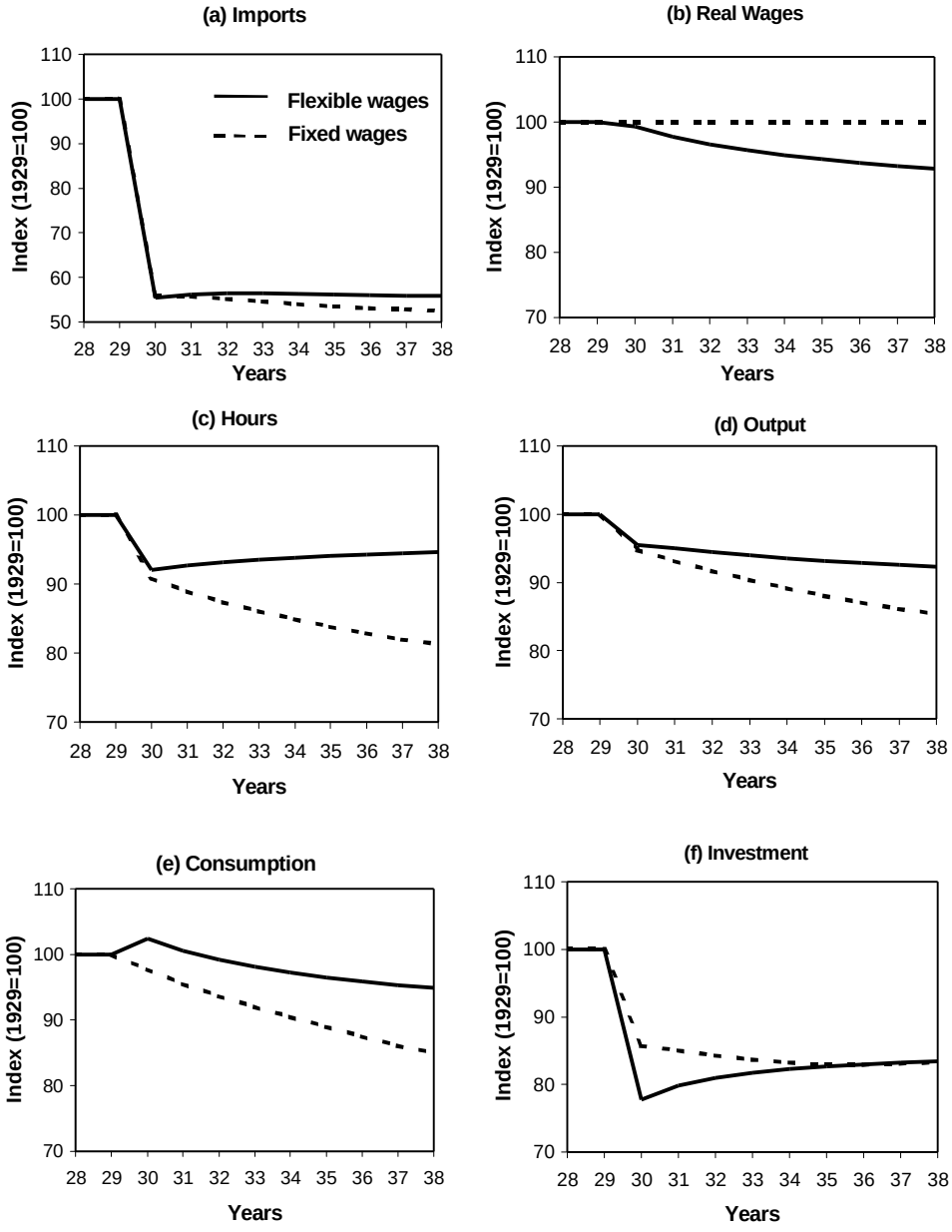


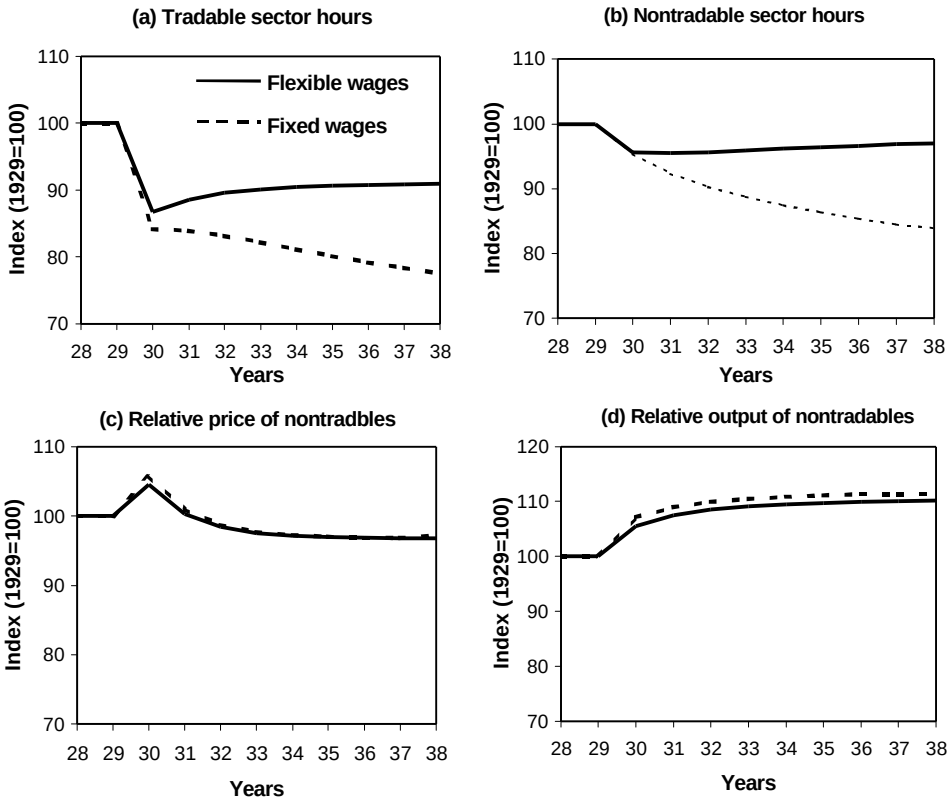

140
130
120
110
100
90
Index (1929=100)
Including agricultural goods
Not including agricultural goods
1929
1930
1931
1932
1933
1934
1935
1936
1937
1938
Years


Tradable sector
130
120
110
100
90
80
70
Index (1929=100)
Real wages
Total hours
1929 1930 1931 1932 1933 1934 1935 1936 1937 1938
Years


Nontradable sector
130
120
110
100
90
80
70
Index (1929=100)
Real wages
Total hours
1929 1930 1931 1932 1933 1934 1935 1936 1937 1938
Years


130
120
110
100
90
80
Index (1929=100)
Real hourly
Real daily
Nominal hourly
1929
1930
1931
1932
1933
1934
1935
1936
1937
1938
Years


(a) Imports
Flexible wages
Fixed wages
Index (1929=100)
Years
(b) Real Wages
Index (1929=100)
Years
(c) Hours
Index (1929=100)
Years
(d) Output
Index (1929=100)
Years
(e) Consumption
Index (1929=100)
Years
(f) Investment
Index (1929=100)
Years


(a) Tradable sector hours
Flexible wages
Fixed wages
Index (1929=100)
Years
(b) Nontradable sector hours
Index (1929=100)
Years
(c) Relative price of nontradbles
Index (1929=100)
Years
(d) Relative output of nontradables
Index (1929=100)
Years