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ALVARO S. PEREIRA



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Alvaro S. Pereira
Department of Economics
University of York
York, YO10 5DD
United Kingdom
asp500@york.ac.uk

Abstract

By combining new archival and existing data, this paper provides estimates of the economic impact of the 1755 Lisbon earthquake, the largest ever-recorded natural catastrophe in Europe. The direct cost of the earthquake is estimated to be between 32 and 48 percent of the Portuguese GDP. In spite of strict controls, prices and wages remained volatile in the years after the tragedy. The recovery from earthquake also led to a rise in the wage premium of construction workers. More significantly, the earthquake became an opportunity for economic reform and to reduce the economic semi-dependency vis-à-vis Britain.

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1. Introduction

"Sometimes miracles are necessary, natural phenomena, or great disasters in order to shake, to awaken, and to open the eyes of misled nations about their interests, [nations] oppressed by others that simulate friendship, and reciprocal interest. Portugal needed the earthquake to open her eyes, and to little by little escape from slavery and total ruin¹."

In the early hours of November 1, 1755, the pious population of Lisbon was attending the celebrations of All Saints Day when a powerful earthquake violently shook the western and southern parts of the country. The earthquake was centered southwest of the Algarve region (about 300 km away from the Portuguese capital), and it was felt in a wide area, from southern Spain and northern Africa, to several regions in Europe². The earthquake was composed of three distinct jolts that started at 9:30 am and lasted for about 9 minutes, being one of the most violent and longest earthquakes on record³, with an estimated intensity between 8.7 and 9 in the Richter scale. After the earthquake, many of the survivors fled to the streets in panic just to be swallowed by a giant wave that swept the harbour some minutes later. Effects from the tsunami were felt all across the Atlantic Ocean, from western Europe to North America, the coasts of Brazil and the Caribbean Islands. In Lisbon, the final blow came when the debris in many of the buildings was ignited by the remains of candles and by looters, giving rise to an intense fire that lasted for five days and destroyed most of the Portuguese capital⁴. When all was done, one of the largest and richest European cities was almost completely destroyed. In the eyes of the contemporaries, the destruction was of apocalyptic proportions, sparking a vigorous debate in Europe on the causes of the earthquake in the years that followed, in which many of the most influential thinkers of the European Enlightenment intervened, such as Rousseau, Voltaire, Kant, among others. Russell Dynes⁵ argues that the 1755 Lisbon earthquake can be characterized as the first "modern" disaster, because of the unprecedented

¹ Vandelli "Modo de Evitar."

² The estimated area affected by the earthquake varies immensely, from 800,000 km² (Chester "The 1755 Lisbon") to 35 million km². Recently, Johnston ("Seismic") updated the estimates to around 15 million km².

³ Records show that the intensity of the 1755 earthquake was only surpassed by the 1960 Chile earthquake and the 1964 in Alaska.

⁴ There were also 250 aftershocks in the 6 months after the tragedy, which, according to the Pope representative in Lisbon, led to the collapse of many unstable buildings (Pinto Cardoso "O Terrível").

⁵ Dynes "The Lisbon earthquake", p. 1.

coordinated state emergency response, being also a “turning point in human history which moved the consideration of such physical events as supernatural signs toward a more neutral or even secular, proto-scientific causation.”

In spite of its magnitude and repercussions, the existing literature has tended to downplay the role of the disaster for Portugal's economic woes and subsequent reforms in the late eighteenth century. Estimates of the earthquake are mostly sketchy and somewhat relying on anecdotal data. Using new archival and existing data, this paper tries to remedy this lacuna in the literature by providing estimates of the economic impact of the 1755 earthquake. The paper proceeds as follows. Section 2 examines the main direct effects of the disaster, and provides new estimates of casualties and of the total GDP loss. The section also presents the impact of the earthquake on both prices and wages. Section 3 analyzes the long-term impact of the disaster, focusing on the institutional changes that followed the economic woes caused by the tragedy. This section argues that the 1755 Lisbon earthquake contributed to the implementation of several institutional changes and provided an opportunity to reform the economy. The long-term performance of the Portuguese economy benefited accordingly, and the situation of economic semi-dependency vis-à-vis Britain was reduced. All in all, the conclusions of this paper suggest that some natural hazards have long-term economic effects, corroborating the findings of recent works by Mark Skidmore and Hideki Toya and by Kerry Odell and Marc Weidenmier⁶.

2. The Direct Effects

This section estimates the direct effects of the earthquake. New estimates of casualties are presented and the impact of GDP is assessed through a decomposition of the main damages of the disaster. In addition, the earthquake's impact on prices is analyzed at the regional level, and new data on builders' wages are presented.

⁶ Skidmore and Toya “Do Natural”, Odell and Weidenmier “Real Shock”.

2.1. Impact on Population

Estimates of the death and casualty tolls of the 1755 earthquake vary tremendously, ranging from 10,000 to almost 100,000 in Lisbon alone⁷. The widely divergent figures are partly due to the lack of reliable estimates of the Portuguese population before 1755. The uncertainty surrounding casualties also persists because, fearing the advent of plague and disease, the government ruled that the corpses should be disposed swiftly, many of them being thrown out in the sea. Many people also changed parish after the earthquake.⁸ The uncertainty surrounding the casualty toll makes it difficult to assess the real human impact of the earthquake and the corresponding damages. In order to get a better picture of the casualty toll, new estimates were obtained by combining several sources and by correcting some of the existing estimates. The sources used were the 1758 "Parish Memories" (*Memórias Paroquiais*), as well as the works of Alfredo de Matos and Fernando Portugal and Pereira de Sousa⁹. These sources were combined to produce Table 1, which shows the number of dwellings and residents before and after 1755 in all Lisbon parishes plus 7 others¹⁰ that were later incorporated into the city. The last two columns of table 1 present the degree of intensity in the modified Mercalli scale (MMS) and the damage sustained as estimated by Pereira de Sousa. From table 1, we can see that the number of dwellings before the earthquake was above 33,000, whereas, after the earthquake, the number of dwellings in the 38 parishes falls to less than 20,000. This loss of about 13,000 houses is similar to that reported by José A. França¹¹.

⁷ Some of the most influential studies of the disaster report the following death figures in Lisbon: Moreira de Mendonça (1758) 10,000; Manuel Portal (1758) 12,000-15,000; Matos and Portugal ("Lisboa") 12,000; Kendrick ("Lisbon") and Maxwell ("Pombal") 15,000; Haug (cited in Pereira de Sousa "O terremoto") 30,000; Pereira de Sousa ("O terremoto") 15,000-20,000. According to Pereira de Sousa, the number of injured was between 40,000 and 50,000. Most of the deaths and casualties were directly related to the earthquake, although Pereira de Sousa reckons that there were 2,000-3,000 deaths caused by the fire, and Baptista et al. ("The 1755") estimate that the number of tsunami casualties was about 900, and that the penetration of the waters was 250 meters.

⁸ It also seems likely that the government tried to downplay the casualty toll, while it overestimated the economic losses, to provide a rationale for the urgency and the need to intervene in the economy.

⁹ Matos and Portugal *Lisboa*, Pereira de Sousa *O Terremoto*

¹⁰ Ameixoeira, Benfica, Campo Grande, Carnide, Charneca, Lumiar, Torre do Lumiar, and Olivais

¹¹ França *Lisboa*. Still, before 1755, França's guess-estimates suggest 20,000 dwellings and not 33,000.

Even so, 13,000 should be seen as a lower-bound estimate, since many of the reported dwellings after the disaster were either wooden huts or were in precarious conditions.

Table 1 _ Earthquake Damage by Parish (*freguesia*)

Parish	Before 1755		After 1755		MMS	Damage
	dwellings	residents	dwellings	residents		
Ameixoeira			88	338	IX	ruined
Anjos	2146	8441	612	2117 ⁱ	IX	ruined
Benfica			805	3962	IX	less ruined
Campo Grande			225	1650	IX	less ruined
Carnide			255	1390	IX / X	ruined
Chagas de Jesus					n.a.	burnt
Charneca			258	1154	IX	less ruined
Encarnação	2027	9516	851 ⁱⁱ	4000	IX	burned
Loreto					n.a.	burned
Lumiar			450	2226	IX	less ruined
Martires	1531	6557	7	46 ⁱⁱⁱ	X	burned
Nossa Sra. Ajuda	1059	4748	1000	4730 ^{iv}	VIII / IX	less ruined
Nossa Sra. Da Conceição	850	3783	84	438 ^v	IX	burned
Nossa Sra. Da Pena	1403	5371	377 ^{vi}	1432	IX / X	ruined
Nossa Sra. Das Mercês	840	3800	807	3483	IX	ruined
Olivais			647	1770	VIII / IX	less ruined
Patriarcal	85	1261			n.a.	burned
S. André	146	575	270	663	IX	ruined
S. Bartolomeu	148	574	51	170	X	burned
S. Catarina	1874	8255	1778	8160 ^{vii}	X	ruined
S. Cristovão	432	1901	230	834	IX	ruined
S. Cruz do Castelo	322	1352	60 ^{viii}	251	X	burned
S. Engrácia	1327	5753	1262	6362 ^{ix}	IX / X	less ruined
S. Estevão	1108	4353	878	3724 ^x	IX / X	less ruined
S. Isabel	1289	5357	2415	11605	VIII / IX	less ruined
S. João da Praça	305	1359	10	50 ^{xi}	X	burned
S. Jorge	69	335	72	376	IX	burned
S. José	1035	5005	1160	6000 ^{xii}	IX / X	less ruined
S. Julião	1608	7016	394 ^{xiii}	1719 ^{xiv}	X	burned
S. Justa	1156	7782	361	3441	IX / X ^{xv}	burned
S. Lourenço	152	619	143	725 ^{xvi}	IX	ruined
S. Mamede	318	1420	12	60 ^{xvii}	X	burned
S. Maria Madalena	805	3743	93	434 ^{xviii}	IX / X	burned
S. Maria	911	4255	150	730	IX	burned
S. Marinha do Outeiro	200	715	165	782	IX / X	less ruined
S. Martinho	56	837	50	910 ^{xix}	X	less ruined
S. Miguel	869	3429	666	2300 ^{xx}	IX	ruined
S. Nicolau	2333	9859	575	1534	X	burned
S. Paulo	755	3958	220	1350 ^{xxi}	X	burned
S. Pedro	350	1550	150	700	X	ruined
S. Sebastião da Pedreira	604	2835	862	3425	VIII	less ruined
S. Tiago	120	662	60	240	IX/X	less ruined
S. Tomé	260	1186	250	909	VIII / IX	less ruined
S. Vicente de Fora	544	2368	552	2485	X	ruined
Sacramento	642	3119	137	1064 ^{xxii}	X	burned
Salvador	268	1046	300	800	X	ruined
Santos	1807	7870	1836	8403	VIII / IX	less ruined
Socorro	1556	5774	830	3330	X / IX	ruined
Torre de Lumiar			442	2182 ^{xxiii}	IX	less ruined
Sum	33,310	148,339	22,900	104,747		(A)
Sources' Disparities				9,644		(B)
Total	33,310	148,339	21,934	114,391		(C)
Totals without 7 parishes	33,310	148,339	19,730	89,782		(D)

Table 1 notes:

ⁱ No numbers available from *Memórias*, only from Pereira de Sousa ("O terremoto"). Since the inhabitants/dwellings ratio was 3.9 before 1755, we can estimate that the number of dwellings after 1755 was around 612.

- ii Only the number of residents is available after 1755. The number of dwellings is found by taking into account the pre-1755 dwellings/inhabitants ratio.
- iii The numbers from Pereira de Sousa probably include people living in huts. The report from the parish's priest is fairly detailed, in which we learn that "Currently there are in this parish seven dwellings in which reside forty six people, since due to the earthquake it lost all its houses" (Matos and Portugal, op. cit., p. 185).
- iv No numbers available. However, the *Memórias* reveal that this was "the one that suffered the least".
- v The numbers of Pereira de Sousa seem more credible since this parish was burned. The numbers of the *Memórias* are not likely, since they were even higher than before the earthquake.
- vi Only the number of people after 1755 available. Dwellings found by keeping the pre 1755 dwellings/inhabitants ratio
- vii The numbers of the *Memórias* are accepted since there is a good description. Pereira de Sousa's are similar to these.
- viii Only the number of people after 1755 is available. Dwellings found by keeping pre-1755 dwellings/inhabitants ratio.
- ix The figures from Pereira de Sousa are similar, but they do not include the number of inhabitants.
- x This parish was not severely damaged, and did not seem likely that it lost 250 dwellings. However, the 1780 figures reveal that there were 938 dwellings. Pereira de Sousa's numbers are accepted, instead of those in the *Memórias* (977).
- xi Great disparity in the number of dwellings (300 in Pereira de Sousa, 10 in the Memories). The numbers in the *Memórias* are probably more reliable, since it is not likely that a burned parish only lost one dwelling. Also, the parish's priest provides great detail of the devastation in his description.
- xii Dwellings from Matos and Portugal, inhabitants from Pereira de Sousa.
- xiii Only the number of people after 1755 is available. Dwellings found by keeping the pre 1755 dwellings/inhabitants ratio.
- xiv Pereira de Sousa states that an account from Bautista de Castro gives the same number of dwellings before and after the earthquake. However, this is not very likely, since this is a burned parish.
- xv In most of this parish the intensity of the earthquake was IX, but around the Rossio it was X.
- xvi Pereira de Sousa reports 143 dwellings, whereas the *Memórias* 196. Pereira de Sousa's numbers seem more credible since the parish was ruined. Also, the numbers of the *Memórias* are from 1760.
- xvii The values of Pereira de Sousa are preferred, since the numbers of the *Memórias* are from 1760.
- xviii The number of dwellings is estimated from the pre-1755 inhabitants/dwellings ratio.
- xix The numbers of Pereira de Sousa do not take into account the Limoreiro part of this parish.
- xx The numbers in the *Memórias* (666) are probably more accurate than Pereira de Sousa's (435).
- xxi Pereira de Sousa reports 1000 dwellings and 4000 inhabitants after 1755, which entails no damages or losses. This does not seem possible, since the degree of intensity in this parish was X. The values of the *Memórias* seem better, since there is also a good description of the losses. The number of protestants living in 25 dwellings is also included.
- xxii From the number of dwellings, 180 huts were deducted since they were built after the earthquake.
- xxiii Although there was no parish called Torre do Lumiar, in the *Memórias* the priest details the dwellings and residents of Torre do Lumiar and its surroundings.
- xxiv Post-1755 data were missing for both the number and dwellings and residents only in 4 parishes: Loreto (a small parish made up of Italian residents), Patriarcal (which was inhabited by the religious contingent that served the Royal Household), Chagas de Jesus, and Nossa Senhora da Ajuda. Of all 4 parishes, only the last had a substantial number of dwellings and residents before 1755 (1059 and 4748, respectively). From the reports of Manuel Portal this was the least damaged parish and that there was only a "few deaths".

According to a 1758 account by Moreira de Mendonça, two-thirds of the city were uninhabitable after the tragedy. Thus, besides the 13,000 destroyed, an additional 10,000 dwellings also sustained substantial damage. Our sample consists of 15 burned parishes, 12 severely ruined, and 11 less ruined. The greatest fall in population (about 50,000 people) occurred in the burned parishes, which were also the most densely inhabited before 1755. Ruined parishes also had a considerable loss both in terms of dwellings (at least 3,500) and of people (minus 15,000). In contrast, the least affected parishes witness a gain both in terms of the number of houses (plus 3,500) and of the number of residents (almost 8,000 more). These

figures are consistent with contemporary reports that suggest a big influx of new residents into the less ruined parishes.

From table 1, we are able to get a more accurate account of the human losses related to the earthquake and its aftermath. We should emphasize that the total number of residents does not include children less than 7 years old, since the data from the parishes correspond to the number of confessed people (*rol de confessados*). Thus, 148,339 residents of Lisbon correspond to about 200,000 inhabitants¹². What is most striking about the human losses is that even after we take into account the disparities between the different sources (row B in table 1) and even if we take into account the possibility that many of the survivors left to less ruined parishes or to the surrounding areas of Lisbon, the highest estimate for the post-1755 population of Lisbon is 114,684 people (row C). Even if we assume that, say, 10,000 to 20,000 people left Lisbon altogether (which is not likely, since the records of the time do not suggest such an exodus) or even if we take into account the sketchiness of the data, there would be still more than 25,000 people missing from the figures. Knowing that the children casualty rate was around one-fifth of the total deaths, these calculations suggest that the number of deaths in Lisbon alone was between 30,000 and 40,000¹³.

Besides Lisbon, there were many other towns and villages that were greatly affected by both the earthquake and the tsunami, such as the harbour towns of Cascais (514 deaths), Setúbal (more than 1,000 deaths), and Peniche (more than 50 people engulfed by the sea¹⁴). In the Algarve, the closest region to the epicenter of the earthquake, the devastation was even

¹² Even if the number of confessions underestimates the true number of residents, it is not likely that the number of inhabitants would surpass the 250,000, which conforms to the estimates of some of the contemporaries.

¹³ Although the most credible contemporary accounts (those of the archivist Moreira de Mendonça and the priest Manuel Portal) point out the number of deaths to be around 15,000, their estimates do not seem to be based on the casualty toll for all the parishes, since they were based on an estimated number of dwellings of 20,000. If we adjust their casualty figures to the real number of dwellings before 1755 (more than 33,000), the death toll rises to about 25,000. If we add to this the probable deaths of children, their estimates would also be around 30,000 thousand deaths. These new estimates are also of the same order of magnitude of those presented by the Papal Nuncio in Lisbon (Pinto Cardoso "*O Terrível*"). Thus, they do not seem to be out of order.

¹⁴ The number of casualties from Peniche and Setúbal are from the parish memories reported in Pereira de Sousa, *op. cit.* Cascais's are from Andrade ("*A Vila*"). Setúbal was particularly devastated, not only by the earthquake, but also by the tsunami and a fire that wrecked three whole neighborhoods.

greater. There are several reports stating that Albufeira, Faro, Lagos, Alvor, Quarteira and Portimão were almost totally destroyed by the tsunami and the earthquake, which in many places in the Algarve reached X and XI in the Medvedev-Sponheuer-Kárnik scale. More than 2,000 people died in the Algarve alone. The regions of the Alentejo, Ribatejo and the Lisbon outskirts also reported hundreds of deaths¹⁵. All in all, the total death toll outside Lisbon is likely to have been between 2,500 and 4,000.

In Spain, the number of deaths was much lower than in Portugal. There are 1,214 deaths reported, although the number was likely considerably higher¹⁶. Nevertheless, in contrast to what happened in Portugal, the great majority of Spanish deaths were caused by the tsunami. From the existing reports, only 61 deaths were attributed to the earthquake. Information about the impact on Morocco is a lot sparser and often contaminated by another earthquake that affected the region in late November 1755. Some authors estimate that the Lisbon earthquake and the resulting tsunami might have killed about 10,000 people, and destroyed the cities of Fez and Tanger. All in all, the 1755 earthquake and the resulting tsunami and fires caused between 40,000 and 50,000 deaths in Portugal, Spain and Morocco.

2.2. Impact on GDP

The impact on GDP is harder to assess, since very often the estimated losses are either not credible or exaggerated. In Lisbon alone, the losses were dramatic. Not only two thirds of the city became uninhabitable, but also virtually all of its big buildings were destroyed: 87 percent of its 40 churches and 86 percent of its 75 convents and monasteries were ruined, and the remaining ones were extensively damaged. Additionally, 33 palaces, the Arsenal, the

¹⁵ For the degree of damage, see Chester "The 1755", p. 266. The death toll in the Algarve reported by several sources in Pereira de Sousa (*op. cit.*) is: Albufeira 500, Boliqueime 150, Castro Marim 150, Faro 700, Lagos 400, Loulé >150, Lagoa "many people", Portimão "many people", Silves 200, and Tavira 250. For Lisbon and Alentejo: Sintra 24, Penha Verde 73, Ericeira "several people", Ribatejo >14, Alenquer 35, Santarém "many deads", Palmela 14, Évora 1, Odivelas > 40.

¹⁶ Martínez Solares and López Arroyo "The Great Historical"

Patriarchal Palace and the Royal Library were completely ruined. All this destruction took place in one of the richest and opulent cities of eighteenth-century Europe¹⁷. The riches of Lisbon were not only from the wealth accumulated during Portugal's geographical discoveries, but also from the massive gold and diamond inflows coming from Brazil since the early 1700s. Therefore, in face of these immense riches, it is not surprising that the reports of the losses were nothing less than catastrophic.

An anonymous French witness of the disaster estimates the following losses (all values in *livres*): 12,000 houses lost and 5,000 severely damaged, 32 parochial churches, 60 small private churches, 22 men convents, 21 women convents, 53 palaces, 9 Public Buildings with an estimated value of 20 million, furniture lost 1,200 million, interiors of Churches (sacred vases, ornaments, furniture, statues, etc) 32 million, diamonds lost and jewelry 80 million, and the losses incurred by foreigners at 260 million (of which the English lost 160 million). According to this account, around 1,500 million *livres tornois* (more than 266,000 *contos*) were lost to the disaster¹⁸. Another anonymous source estimates the overall losses at about 120,000 *contos*¹⁹, although no detailed amounts are presented. One of the most popular works in the 1750s assessed the losses as follows²⁰: 12,000 dwellings each valued at 960,000 *reis* (0.96 *contos*); the Terreiro do Paço area 4,000 *contos*; money lost 4,000 *contos*; gold, silver, diamonds, libraries and furniture valued at 210,000 *contos*; losses sustained by foreigners 38,400 *contos* (of which the British lost more than 25,600 *contos*). More recent estimates decrease the losses, although the values are still very considerable. Carlos Estorninho uses British consular sources to estimate a total loss of about 86,000 *contos*, of which more than 40 percent belonged to foreigners. José Luís Cardoso combines the estimates from the

¹⁷ As (Kendrick *Lisbon*, p. 28) emphasizes: "[T]he most important thing about Lisbon was that it was staggeringly rich, rich in the almost fabulous contents of its palaces and churches, rich in the great stores of bullion and jewels and costly merchandise in its wharves and business premises, rich in its tremendous commercial importance".

¹⁸ Pereira "O terramoto de 1755"

¹⁹ França *Lisboa* p. 68. Most of the values presented in this paper are in *contos de reis*. The *rei* was the basic monetary unit in Portugal in the 18th century, and 1 *conto de reis* = 1,000,000 *reis*. *Cruzados* were also often used. The corresponding exchange rates are: 1 *cruzado* = 400 *reis*; 1 *livre tornois* = 160 *reis*; £1 = 3600 *reis*.

²⁰ Reported in França *Lisboa*, p. 68

contemporary accounts with trade data for 1755 to get an estimate of around between 100 and 150,000 *contos*²¹. Since the estimates for Portuguese GDP in the 1750s are between 150,000 *contos* and 200,000 *contos*²², the total direct losses vary between 43%-57% (Estorninho "O Terramoto"), 75% (Cardoso "Pombal"), 115-153% (França "*Lisboa*") and 133-178% (Pereira "O Terramoto") of Portuguese GDP.

In face of such wide estimates and since other losses were not taken into account for these calculations (e.g. the palaces and the churches), new estimates were found by using different sources. The losses of dwellings were calculated from table 1, and its average value was established at 0.96 *contos*. This value was also confirmed by archival work from records of houses demolished in the city center²³. In addition, although the wealth of the churches and convents varied dramatically²⁴, an average value for convents and churches was guess-estimated from the reports of the losses in the *Memórias Paroquiais* and in Pereira de Sousa's classic work. Convents/monasteries were estimated to be worth an average value of 300,000 *cruzados* (120 *contos*), nun convents 200,000 *cruzados*, hospitals 250,000 *cruzados*, and churches 200,000 *cruzados*. These guess-estimates seem consistent with the estimated losses in Church interiors and damages to buildings reported by Ângelo Pereira²⁵, which totaled around 5,000 *contos*. These values were adjusted for the degree of damaged sustained. Palaces also varied tremendously in their riches, but were estimated at 300 *contos* each. The total losses in the *Terreiro do Paço* include the Royal Palace, the Patriarchal, a brand new sumptuous opera house, the Customs House, a new Stone Quay, and several storage buildings. The total value for the *Terreiro do Paço* is estimated by some contemporaries' accounts reported in Pereira de Sousa at 4,000 *contos*.

²¹ Cardoso "Pombal" .

²² Valério "Portuguese".

²³ Ministério do Reino, lv. 416 "Registo de Correspondência e providências sobre o terramoto de 1755". This value is also used by França in *Lisboa*.

²⁴ For instance, the biggest Lisbon convent, the Carmo, had 20 chapels, 25 altars, 4 church organs valued at 50,000 *cruzados* (20 *contos*) each, a library worth more than 200,000 *cruzados* (80 *contos*), among many other riches, whereas other convents and *recolhimentos* were a lot more modest. Pereira de Sousa "O terremoto"

²⁵ Pereira "O Terramoto"

According to the historical accounts, some of the greatest damages were in terms of diamonds, gold, silver and furniture lost, as well as losses to foreigners. Consequently, especial attention was given to them. In terms of diamonds, one of the few reliable contemporary sources, the priest Manuel Portal argues that just in the earthquake- and tsunami-ravaged India House (*Casa da Índia*) there were “11 to 12 million in diamonds” from Brazil. Since these reports are not explicit which currency is used. Since there were several currencies and different units of account utilized at the time (*reis*, *cruzados*, *livres*, etc), it is fairly difficult to get accurate estimates of the values lost. França²⁶ assumes that the 11 or 12 million are in *cruzados*, which is equivalent to 30 million *livres* or 1,920 *contos*. If these estimates were correct, 1.5% of Portuguese GDP was lost just with the diamonds from the India House. Even more dramatic, other contemporary accounts²⁷ claim that the total losses in diamonds alone were around 18,000 *contos*, which is equivalent to 10-15 percent of Portuguese GDP. In face of these colossal losses claimed by the contemporaries and the inexistence of reliable statistics for the period, the only feasible way to check these numbers is to confront them with the existing figures for the diamond extraction and sale. Diamonds were discovered in Brazil in the 1720s, and in 1734 a formal diamond region (the *Tijuco*) was created. In order to control the extraction and disposal of diamonds, from 1740 onwards, the Portuguese government granted monopoly rights for its exploitation based on a series of contracts. From 1740 to 1755, the total value of diamonds extracted amounts to 6,447 *contos*²⁸. Even if we allow for smuggling, it is likely that only a small part of this would end up in Portugal. From the total value extracted, we should subtract the diamonds sold in Europe, which amount to at least 857 *contos*. Assuming that the quantity of diamonds from non-Brazilian sources was not very significant, the total value of the diamonds did not exceed 5,000 *contos*, which is substantially lower than the claims of the contemporaries of the earthquake. Even the figures for the India House are certainly

²⁶ França *Lisboa*.

²⁷ Cited in França *Lisboa* and Pereira “O Terramoto”.

²⁸ Marques and Serrão, vols. 7 and 8.

overestimates, since the total extracted value for 1754 and 1755 is only about 1,000 *contos*, of which more than 800 *contos* were sold to European traders. All in all, even if we assume that indeed the Royal household, the Church and other individuals lost a great part of their diamonds to the earthquake, tsunami and fire, it is very unlikely that these losses totaled more than one or two fifths (1,000 to 2,000 *contos*) of the total value of the diamonds that existed in the whole of Portugal.

Additionally, although we do not have reliable figures for the losses of gold, silver and furniture by private individuals, it is extremely unlikely that the estimates by the contemporaries of the disaster are credible. In fact, there are plenty of reports of robberies during this period, and hence it is probable that most of the gold and silver just changed hands. Therefore, and since many of these losses are already covered by the damages in palaces and religious buildings, a guess-estimate of 10,000 to 15,000 *contos* is given to these damages. The same reasoning applies for the money lost. It is usually assumed by the historical accounts that the losses included those of the Mint of about 2 million (of what?) worth of bullion. However, it is known that the Mint escaped from the earthquake, the fire and the mob, due to the prompt intervention of some dedicated soldiers²⁹. The Pombal government also acted swiftly to protect it by issuing an order on November 3, in which guards were placed in the royal treasuries. The path-breaking work by Rita Martins de Sousa on the Portuguese money supply in the 18th century³⁰ also reveals that, in spite of the large fire, there was only a small amount of re-coinage (0.09 *contos* in 1755, and 40 *contos* in 1756³¹). All in all, it is likely that the bulk of the money lost mostly changed hands and/or was overestimated, and hence a value between 1,000 and 2,000 *contos* seems more reasonable.

Similarly, the amount lost by foreigners is also greatly exaggerated. Although the losses were high, they were not as catastrophic as the initial reports from the British merchants

²⁹ Boxer "Some Contemporary", p.8

³⁰ Sousa *Moeda*.

³¹ Information provided by Rita M. Sousa, calculated from the Archives of the Portuguese Mint.

indicate. Two months after the disaster, British consul Edward Hay reports that "the loss of our trade has sustained is very great, but I am very far from thinking it total³²". Namely, many of the ships and some storage buildings owned by foreigners in Lisbon were not destroyed by the disaster. According to Hay, the British losses were mostly in the cargoes and gold in the Customs House and some warehouses near the Tagus river, whereas the money lost was recovered by many of the merchants. Charles Boxer argues that the main financial losses sustained by the British merchants in Lisbon were the "unavoidable repudiation of their debts by many Lisbon shopkeepers, who were completely ruined by the earthquake. But this local trade was not the most profitable part of the British investment". The same idea is defended by Estorninho³³. Even Hay contends that most of the debts could still be recovered, especially those pertaining to the merchants involved in the Brazilian trade. Obviously, unrecoverable debts should not be included in the final calculations of the earthquake aggregate losses, since, in this case, the British lost while the Portuguese gained. From the accounts by Boxer and Estorninho, it is likely that the losses sustained by the foreign community in Lisbon was about a third of what is reported in some of the historical accounts. Finally, the number of dwellings and convents lost outside Lisbon is also included in the estimated losses. Table 2 summarizes the new damages' estimates. The direct damage of the 1755 earthquake is estimated between 32 and 48 percent of Portuguese GDP, a considerable amount that reflects the opulence and the riches of eighteenth century Lisbon, giving credence to the idea that the losses of the disaster were very substantial, although not as catastrophic as many contemporary reports and existing estimates indicate³⁴.

³² Cited in Boxer "Some Contemporary".

³³ Boxer "Pombal's", p. 15. Estorninho "O Terramoto"

³⁴ In Spain, Fernando VI ordered an inquiry into the effects of the earthquake (as Pombal did for Portugal). The surviving information from this inquiry pertains to 1273 towns, of which 1216 reported signs of seismic intensity values. Martínez Solares and López Arroyo ("The Great") estimate that the total Spanish losses from the earthquake and tsunami amounted to about 70 million *reales de vellón* or 536 million 2002 euros. They argue that the tsunami would have caused only about 5% of the total damage in Spain, and that this was equivalent to 20 percent of state expenditure in 1755. Unfortunately, the sketchy data from Morocco do not allow us to estimate the damage caused by the 1755 November 1 earthquake in that region.

Table 2 _ Losses from the Earthquake, Fire and Tsunami (in *contos*)

	Quantity	Estimated damage per unit	Hist. Accounts (Estorninho 1956)	Historical accounts II (Pereira 1953)	Historical accounts I (França 1983)	Total New estimates
Dwellings					11.520	
burned parish	11639	0.960				11,173
ruined parish	3865	0.960				3,71
Damaged	~ 5000	0.1-0.2				500-1,000
Convents monks				(22)		
Burned+ruined	8	120				960
Only Ruined	22	80				1,760
Less ruined	9	20				180
Convents nuns				(21)		
Ruined	24	80				1,920
Less ruined	2	10				20
<i>Recolhimentos</i>						
Burned	3	60				180
Ruined	3	40				120
Less ruined	1	10				10
Churches destroyed				(92)		
Burned parish	17	80				1,360
Other parish	16	80				1,280
Damaged	59	20				1,180
Interiors of Churches				5,120		
Hospitals	6	100				600
Palaces						
Ruined + burned	28	300		53		11,200
Terreiro do Paço				3,200	4,000	4,000
Diamonds				12,800	17,927	1,000-2,000
Crown					4,802	
Private					8,003	
Church					5,122	
Gold, Silver+Furniture				192,000	210,000	10-15,000
Money Lost					4,000	1,000-2,000
Losses by foreigners			36000	41,600	38,400	12,800
<i>Outside Lisbon</i>						
Dwellings ³⁵	5,000-7,000	0.640	n.a.	n.a.	n.a.	3200-4480
Convents	5-10	50	n.a.	n.a.	n.a.	250-500
Grand total	-	-	85,800	266,240	229,520	63,693-72,193
Losses as % of GDP	-	-	43-57%	133-178%	115-153%	32-48%

Source: Pereira de Sousa "O Terremoto"; Matos et al. "Lisboa", Conceição "Notícia"; Pereira "O terramoto"

2.3. Prices

One of the most important short-term impacts of the 1755 earthquake concerned the dramatic changes in absolute and relative prices, both at the national and regional level. In general, the changes in prices were only transitory, but substantial volatility remained for some time. This is especially true for some of the main staples, like wheat, in the most affected regions, such as Lisbon and the Algarve. Table 3 summarizes the main effects of these price changes at the city or town level. In the first year after the earthquake, price controls imposed

³⁵ Since wages in Coimbra are about two-thirds to those in Lisbon, it is assumed that property values have the same differential between Lisbon and the rest of Portugal.

by the government seem to have had an effect, at least in the most affected areas from the earthquake. In fact, in Lisbon, prices of wheat and barley decreased, probably due to the price controls, which were most effective in the perimeter around the city. In contrast, in important cities and towns such as Porto, Coimbra and Aveiro, wheat prices increased by more than 20 percent, whereas in more remote areas like Bragança and Évora wheat prices declined. In general, the prices of other cereals declined between 1755 and 1756. In contrast, in the second year after the earthquake, the price ceilings were no longer effective, and cereal prices increased substantially in most markets.

Table 3 _ Annual Price Changes by city, 1755-1758 (%)

City	1755-1756	1756-1757	1757-1758	City	1755-1756	1756-1757	1757-1758
<i>Lisbon</i>				<i>Aveiro</i>			
Wheat ³⁶	- 20	+ 83	- 15.7	Wheat	+ 26.7	0	+ 18.4
Barley	- 30	+ 171.4	- 36.8	<i>Bragança</i>			
Millet	n.a.	+ 89.1	+ 5.1	Wheat	- 20	+ 50	- 33.3
Olive oil	- 8	+ 7.4	-2.6	Barley	- 33.3	+ 50	- 33.3
Rice	+ 25	- 4.8	+ 15.3	Rye	- 36	+ 75	+ 50
<i>Porto</i>				Wine	0	- 40	0
Wheat	+ 22.2	+ 9.1	+ 8.3	<i>Coimbra</i>			
Corn	-16.1	+ 15.4	+ 26.7	Wheat	+ 20	+ 25	0
Rye	-13.3	+ 46.2	+ 5.3	Corn	+ 26.3	+ 33.3	- 15.6
Olive oil	- 3.6	- 7.4	- 8	Rye	+ 33.3	- 18.8	+ 15.4
Green Wine	+ 50	- 20	0	Beans	+ 46.7	- 15.9	- 24.3
Poultry	- 16.7	0	+ 20	Olive oil	+ 3.8	- 15.7	- 14.3
Mutton	0	0	0	Wine	+ 116.7	- 53.8	- 20
Butter	0	0	0	<i>Évora</i>			
Oak wood ³⁷	0	0	+ 63.3	Wheat	-19.4	+ 106.9	+ 6.7
Linen	- 25	0	0	<i>Viseu</i>			
<i>Braga</i>				Wheat	+ 9.5	+21.7	+ 3.6
Wheat	+ 35.4	-4.6	+3.2	Beans	- 8.4	- 18.1	+ 41.9
Corn	0	0	+15.4	Chickpeas	- 5.6	+ 7.9	+ 21.5
Green Wine	+ 187	- 60	+ 25	Chestnuts	56.6	-27.4	+ 22.6

Calculated from: Amorim "Aveiro", Lopes "Pobreza", Godinho "Prix", Oliveira "A Beira", and Oliveira "Elementos"

In Lisbon, this is particularly noticeable, since wheat prices rose by 83 percent, barley's by 171.4 percent and the price of millet increased by 89 percent. In all other regions, wheat prices rose substantially, as did the prices of other cereals. By the third year after the earthquake cereal prices started to decline with respect to their previous levels. In the following years, the amplitude of the price changes declined. The price of wood is the exception,

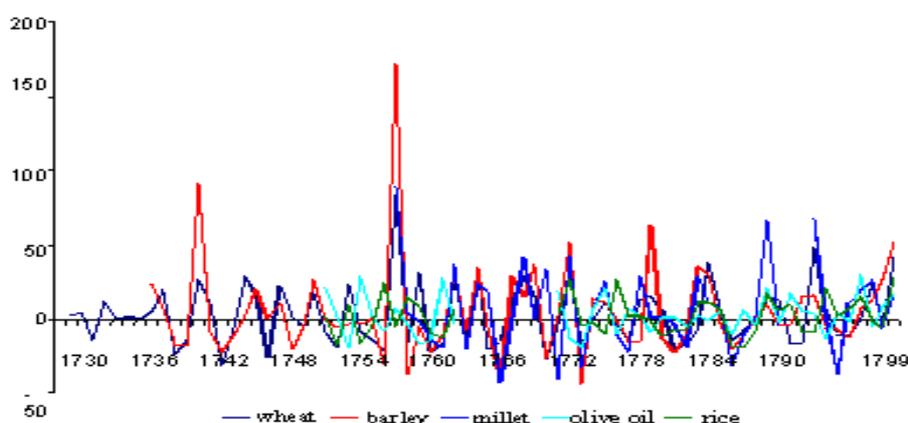
³⁶ The prices of wheat in Lisbon remained volatile until the early 1760s.

³⁷ The price of oak wood was subsequently revised downward by 38.7% between 1758 and 1759.

increasing dramatically in the third year after the initial clean up of debris was completed in the center of Lisbon.

Prices of construction materials also rose substantially after the disaster. The archives of the Lisbon Inquisition show that there was a dramatic increase in the price of wood and of whitewash. The average price of whitewash was between 1200 and 1300 *reis* per *moio* between 1740 and 1755. In contrast, in 1756 and 1757, the average price of whitewash was between 1900 and 2000 *reis* per *moio*, a 60 percent increase relative to its pre-earthquake level. Aware of the supply shortage of this building material, on the November 3, 1756 the Pombal government gave William Stephens a license of exploration of a whitewash factory, for which he was granted a privileged position in exchange of the promise to sell it at a reasonable price. Additional rulings on that factory followed on February 17, 1757, and on July 29, 1757, in which the government issued orders to buy any remaining whitewash and wood that could not find buyer. Boosted by the rise in supply, the price of whitewash fell, and by early 1758 it had returned to its pre-earthquake level of around 1250 *reis* per *moio*. Throughout the 1760s, the average price of whitewash oscillated between 1200 and 1500 *reis* per *moio*, with the highest level occurring in 1769. Finally, the earthquake also had a substantial effect on price volatility. In Lisbon, in the immediate years after the earthquake price volatility became greater than even in more inflationary periods such as the 1760s and the early 1800s (figure 1).

Figure 1 _ Annual Price Changes in Lisbon, 1728-1800 (%)



Source: Calculated from Godinho "Prix"

All in all, the earthquake had a substantial, albeit transitory, effect on prices, leading to an increase in their volatility during the immediate years after the disaster.

2.4. Wages

The earthquake also had a significant, albeit temporary, effect on wages, increasing the wage premium to construction workers. In the early days after the disaster, several accounts report an acute shortage of stonemasons and, especially, carpenters. The letters of the Pope representative in Lisbon suggest that for several months there was a dire need for carpenters, and it was difficult to find someone willing or able to work even to build a hut for the royal family to live. Thus, wages rose sharply in the immediate days after the disaster. In Lisbon, in the decades prior to the earthquake carpenters' and masons' wages were nominally fixed at 300 *reis* per day, whereas masters earned a daily wage of 350 *reis*. After the earthquake, the supply of carpenters and masons shrunk, while there was a huge increase in demand for builders' services, since in the months following disaster more than 9,000 wooden huts were built around Lisbon. Not surprisingly there were reports that:

"In the first days [after the tragedy] one could not find a mason or a carpenter but soon enough there were double the number than those that existed before, since all wanted to learn such a job, mainly that of carpenter, and even if he were paid at 400 and 500 reis per day they could not be found" (translated from a manuscript cited in Pereira de Sousa, "O terremoto", pp. 518-19)

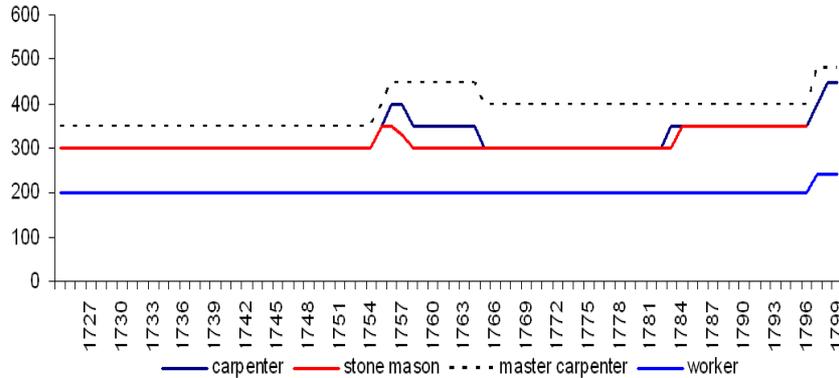
In spite of these anecdotal accounts, there is no consistent report on how wages behaved after the earthquake. Since we have no wage data for the period before 1766, new original data had to be obtained from the archives of several institutions. Although the earthquake destroyed a huge amount of records³⁸, there are still many data sources available. For Lisbon, construction data were obtained from both the archives of the Royal Household (*Casa Real*) and the Lisbon Inquisition. After 1766, the archival data are combined with the existing data from the *Misericórdia de Lisboa* gathered by Nuno Madureira³⁹. All series were

³⁸ Due to the destruction, many series start only in 1755 or 1756.

³⁹ Madureira *Mercados e Privilégios*

consistent with each other, and were combined to create a series of nominal wages for construction workers (Figure 2).

Fig. 2_ Wages for Construction Workers in Lisbon, 1722-1800 (reis per day)

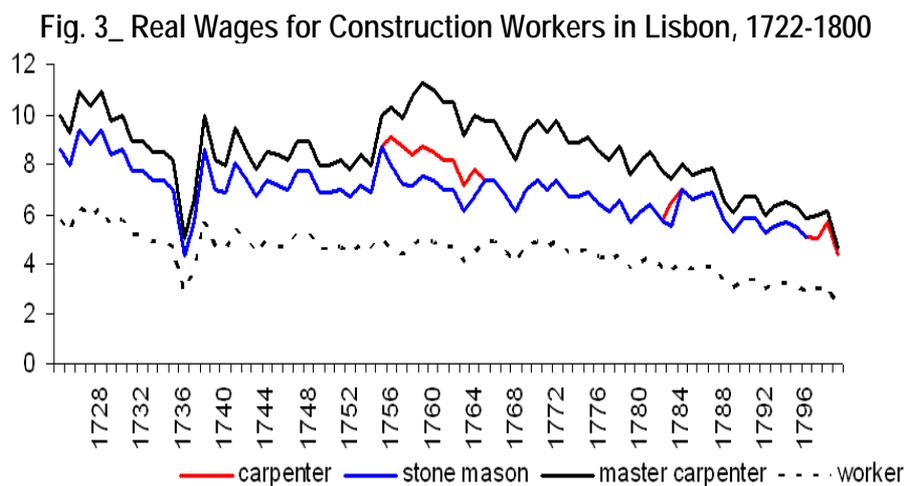


Source: *Arquivo da Casa Real and Arquivo da inquisição, Portuguese National Archives: Builders expenses. Madureira ("Mercados")*

In Lisbon, we have strong evidence of the impact that the earthquake had on the daily wages of the workers associated with the reconstruction, especially builders and carpenters. In the archives of the Inquisition, there are hundreds of weekly records of reconstruction orders and work from November 15, 1755, onwards providing detailed information on the wages of the workers involved in the reconstruction. From those records, we can see that, initially, posted wages did not change, since carpenters and builders continued to earn 300 *reis* per day, whereas workers were paid 200 *reis*. In April 1756, the shortage of workers temporarily increased their wage to 240 *reis* a day, but by November their wages had returned to their initial level of 200 *reis*. In contrast, the wages of skilled workers did not increase initially, remaining at 300 *reis* for both carpenters and builders until the first weeks of June 1756. Master carpenters and stone masons were still paid 350 *reis* a day. However, by June of 1756, the records of the Lisbon Inquisition show that the wages of these skilled workers started to increase. In the second week of June carpenters were paid 330 *reis*, and from the third week onwards they were paid 350 *reis*. By August, wages keep rising and several carpenters and stonemasons were already paid 400 *reis* per day, which is more than what masters earned before the earthquake. Wages between 350 and 400 *reis* became the norm for skilled

construction workers until about the mid 1760s. In contrast, unskilled workers saw their wages remain at 200 *reís* per day.

Similar figures also appear in several construction works in the properties of the Royal Household. Carpenters and stonemasons earned 300 *reís* until around June/July 1756, and from then onwards they started to earn 350 and 400 *reís*. Therefore, even in the royal household the wage controls on construction workers were not enough to stop the rise in wages. However, the Royal Household tried to disguise this rise in nominal wages until at least November 1756. Wages remained at 300 *reís*, but were supplemented by granting exceptional bonus to construction workers, such as siestas (an additional 100 *reís*) and money for lunch (50 *reís*). By the end of the year, these supplements were fully incorporated in the construction workers' wages. Again, wages remained at this higher level until about mid 1760s, after which they went back to their pre-earthquake level. In addition, real wages were also calculated by adjusting nominal wages with an aggregate price index from Nuno Valério⁴⁰. Real wages for skilled builders also had a temporary improvement in the years following the disaster, but declined afterwards (figure 3).



Source: Figure 1 for wages, Valério ("Portuguese") for prices

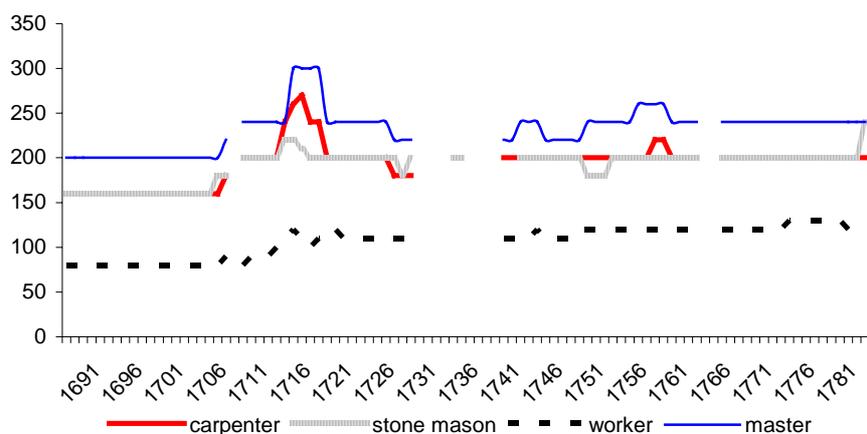
There are several reports that indicate that the shortage of builders was felt for some time in the capital. In 1759, the Chief Cardinal in Lisbon penned himself a religious decree

⁴⁰ Valério "Portuguese"

(*pastora*), in which carpenters and masons were mandated to abstain themselves from work on Sundays and Holy Days. In turn, the premium on skilled workers in the medium term led to a rise in the number of carpenters and masons. The number of carpenters remained above average until the reconstruction work was done in the early decades of the 19th century⁴¹.

Outside Lisbon, this temporary increase in wages does not seem to have been replicated in regions less affected by the earthquake. In Coimbra, 200 km north of Lisbon, wages for regular construction workers remained almost unaltered. Archival work from the University of Coimbra and the Misericórdia of Coimbra (an institution of welfare support) shows that there was only a small increase in nominal wages for master carpenters in 1756 and 1757. The wages of regular carpenters and stonemasons were unaffected. By 1758, wages were back to their previous levels (figure 4).

Fig. 4_ Construction Workers' Wages in Coimbra, 1687-1782 (in reis)



Finally, we should mention that one of the economic consequences of the earthquake was to temporarily disrupt the nominal rigidity of nominal wages, at least in the most affected regions, such as Lisbon. Before 1755 there was a high degree of nominal wage rigidity, since wages for carpenters and stonemasons remained at 300 *reis* per day from 1722 to 1755, whereas masters earned between 350 and 400 *reis*. Thus, in the most affected regions, the earthquake temporarily disrupted the secular rigidity of nominal wages.

⁴¹ Madureira *Cidade*.

3. Indirect Effects and Long-Term Impact

Although economic theory tends to characterize natural disasters as mere exogenous shocks that temporarily disrupt an economy, recent studies have shown that natural hazards can have long-term effects on economic performance. For instance, Skidmore and Toya (2002) use a sample of 89 countries for the 1960-90 period and find that impact of natural hazards on economic growth varies by type of disaster. They argue that climate-related disasters tend to have a positive effect on growth, whereas geologic disasters have either a negative or insignificant impact. In turn, Odell and Weidenmier (2004) argue that the 1906 San Francisco earthquake had a substantial impact on financial markets, contributing to permanent changes in the institutional structure of the United States. In similar fashion, the 1755 Lisbon earthquake also had a considerable long-term impact, which significantly affected the long-run performance of the Portuguese economy.

It is more or less consensual that the earthquake had a long-lasting effect politically, due to the rise of influence and power of Sebastião José de Carvalho e Melo, better known as the Marquis of Pombal, who became the dominating figure in Portuguese politics until the death of the king, D. José I, in 1777. The mythology surrounding Pombal portrays him as an enlightened dictator that rescued Portugal from the asphyxiating influence of the triad of the Church (including the Inquisition), a rent-seeking nobility, and the economic dependency from Britain. In reality, Pombal is controversial figure, who defies any kind of simplistic characterization⁴². The earthquake was the defining moment in Pombal's political life, during which he was able to show his organizing and leading abilities. It is very likely that without the prestige and political capital gathered during the recovery and relief efforts, Pombal would have not had the political support necessary for many of the reforms he undertook during the 27 years of his reign.

⁴² Although he showed unequivocal vision in the aftermath of the tragedy and was instrumental for many economic and social reforms, Pombal was a fearful dictator responsible for the torture and killing of many of his political opponents, and who also profited immensely from several shady deals involving the State as well as with the reconstruction of Lisbon.

Namely, without the reputation and status obtained in the disaster, it would have been virtually impossible for him persecute to the Jesuits and to reduce the shadowing influence of the Church. In the same way, Pombal's centralization of the State would have faced a lot more opposition, and his nationalistic commercial and industrial import-substituting policies would have been virtually impossible. Under the strong hand of Pombal, the state was reorganized into an active and reformist administration, which tried to centralize economic operations in order to improve the control of the State in the economy. In order to understand the prestige and power gathered by Pombal, we need to analyze the prompt response in the aftermath of the 1755 disaster. This section reviews the main impact of the earthquake on the policy-making process in Portugal as well as its long-term legacy.

3.1 The Immediate Response and Reconstruction

An unprecedented disaster in Western Europe demanded an unparalleled response. The latter included several vigorous and strict measures not only to maintain public order and to avoid the looting of many of the public treasures and private goods, but also to avoid plague, disease and starvation. The most impressive feature of the response to the disaster was the speed and the degree of centralization that was attained⁴³. From the outset of the relief effort, Pombal assumed a prominent position in the immediate response to the disaster. Of the three secretaries of state in the government, Carvalho e Melo (later better known as Pombal) was the only able or willing to face the dimension of the tragedy. Seizing the opportunity provided by the earthquake, Pombal coordinated and organized the relief effort from his carriage traveling around the devastated capital.⁴⁴ The main features of the recovery and relief efforts were summarized and celebrated in a luxurious book published in 1758 by Amador Patricio de

⁴³ Cardoso ("Pombal") analyzes in more detail the response of the authorities to the disaster.

⁴⁴ As Boxer ("Pombal's Dictatorship", p. 732) puts it: "For several days he lived in his carriage, scribbling proclamations and orders, despatching and receiving courtiers, reassuring the populace, and exhorting them to the work of rescue. During twenty-four hours on end he took no nourishment except a bowl of broth which was brought to him by his wife, who picked her way to his carriage through the debris in the streets".

Lisboa, which was clearly sponsored by the government⁴⁵. The most important immediate policy measures include: i) Prevent pestilence (emphasizing the urgency to dispose of the corpses), ii) Avoid hunger and starvation (policies that included the elimination of duties on foodstuffs, the distribution of food to the homeless and the destitute, and price controls), iii) to cure the ill and injured (e.g. establishment of temporary hospitals), iv) repopulation of the city, v) prevent stealing and punish robbers, vi) to avoid stolen goods to leave by the sea or river, vii) to remedy the needs of the Algarve region and Setúbal, viii) bring troops to the capital to help the recovery effort and reconstruction, ix) to reestablish public goods in order to help inhabitants of the city (water sanitary measures, removal of debris, and rent controls for homes, shops and storage buildings, x) to reestablish religious cult in the remaining churches, xi) to collect and reunite homeless nuns in Lisbon, and the Algarve, xii) religious acts to diminish the Wrath of God and to thank God many graces, xiii) to relieve the people from several necessities, xiv) to arrange the means to rebuild the city (orders to measure and assess all streets, buildings, houses, and public buildings in the ruined parishes, including demotion, grade assessment, and leveling of several parts of the city center. The alignment of the new streets was proclaimed on June 12 and July 12, 1758 and the reconstruction plan was approved on June 16, 1758). In Lisbon, the reconstruction efforts focused mainly in the city center. Before 1755, Lisbon resembled a medieval town with small and disorganized streets⁴⁶. Since the city centre was almost completely destroyed by the earthquake, Pombal and several military architects regarded this as an opportunity to redesign the city and to transform it into a modern metropolis, which was also less prone to earthquake damage. All temporary rebuilding was forbidden until all the debris was cleared from the land and until the plans for rebuilding were finished. In addition, to increase the speed of the reconstruction, pre-fabrication was promoted, and there were incentives to standardize the quality of work materials and the

⁴⁵ Cardoso "Pombal"

⁴⁶ França *Lisboa*.

façades of buildings⁴⁷. A new construction technique (the *gaiola*) was introduced to increase the elasticity of houses, and the new streets were made in straight lines, being wide enough to reduce potential earthquake damage. Benefiting from a wide variety of funds from both the private sector and public institutions⁴⁸, reconstruction in the city centre was relatively swift, starting at the end of the 1750s and ending in the 1780s⁴⁹. However, in other parts of the city and in the less populous parishes rebuilding was often painfully slow. There were about 340 decrees, proclamations, regulations and laws (*decretos, alvarás, portarias* and *editais*) concerning reconstruction work from 1755 to 1838⁵⁰. In spite of the death casualties and the initial exodus from the city, the repopulation of Lisbon occurred more or less swiftly and by 1780, the number of dwellings in the same territory of the old 38 Lisbon parishes had surpassed that of 1755. The recovery was faster in the less ruined parishes, and slower in the ruined and burned parishes. Reconstruction was considerably slower outside Lisbon. In Setúbal, ravaged by the tsunami and also devastated by a fire that followed the earthquake, the city center was also rebuilt relatively fast, but many building in some neighborhoods were still to be recovered by the mid-nineteenth century. In Faro, the capital of the Algarve region and one of the most affected, many buildings destroyed in 1755 were still in ruins in the first decades of the twentieth century⁵¹. Therefore, in spite of a prompt and decisive immediate response in the most populous parts of Lisbon, the reconstruction rates differed widely according to the regions affected and their own economic importance for the Portuguese economy.

3.2. The Long-Term Impact on Economic Policy

Although the earthquake had a substantial, albeit short-lived, influence on the main macroeconomic variables, the long-lasting legacy of the earthquake was a deterioration of the

⁴⁷ Maxwell *Pombal*, p. 24

⁴⁸ Financing was also done by Pombal himself, who was later accused of abusing his position to benefit from the reconstruction of the city.

⁴⁹ Madureira *Cidade*.

⁵⁰ Gomes de Brito cited in Madureira "Cidade", p. 25

⁵¹ Diniz "Arquitectura"

public finances and of the external trade balance, providing both a stimulus and an excuse for an agenda of economic reforms and institutional change introduced by the Pombal-led reformist group that seized power after the disaster. As argued before, the prestige gained from the response to the earthquake gave Pombal an unprecedented political capital in the Portuguese court, which he used in order to implement a series of policies designed not only to enhance the centralization of the (absolutist) state, but also to reduce the dependency vis-à-vis Portugal's main trading partner, Britain. In many ways, the earthquake was not directly responsible for these developments. After all, many of Pombal's policies and reforms had already been pondered when he had been an ambassador to Britain in the 1740s⁵². However, until the earthquake, Pombal did not have the power to implement these reforms⁵³. It is impossible to know whether Pombal would have gone ahead with these reforms if the earthquake had never occurred. Nevertheless, during his first five years in office (from 1750 to 1755) his only major policy was the establishment of the big monopolistic companies for the colonial trade⁵⁴. Thus, the 1755 earthquake was at least indirectly responsible for a change of course in the direction of economic policy. The relief and recovery efforts also showed the need for a centralization of operations, so that the performance of the State could be improved.

3.2.1. Public Finances and International Trade

In terms of public finances, the tremendous losses caused by the earthquake and the large reconstruction effort (of buildings, roads, infrastructures, and so forth) contributed to a turnaround in the financial situation of the State. To make things worse, after decades in which the seemingly unending supplies of Brazilian gold fuelled public expenditures and the construction of sumptuous monuments and churches, in the 1760s the gold remittances started

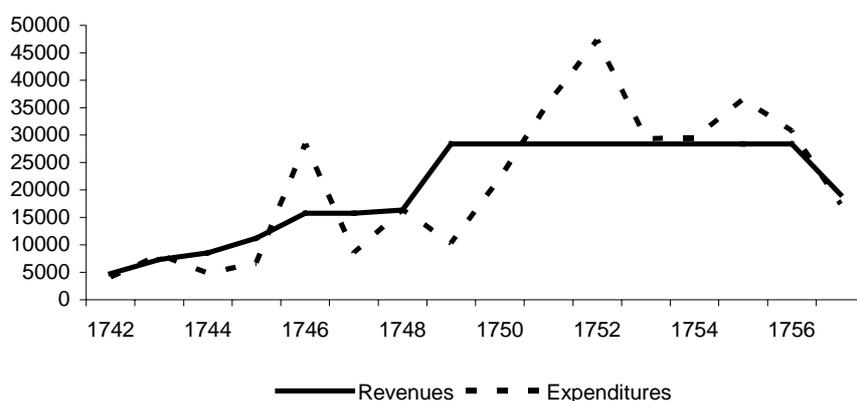
⁵² Cardoso "Política Económica"

⁵³ Many of these reforms had been advocated in the early 1700s by D. Luís da Cunha, the political mentor of Pombal. Mercantilist policies had also been tried, timidly, in the late seventeenth century with relative success.

⁵⁴ Macedo *A Situação Económica*

to plunge, adding strain on the public finances. According to Álvaro F. Silva⁵⁵, the sources of the financial crisis were mostly related to the reduction in the colonial revenues (especially gold and tobacco), external threats (most notably the Seven Years War), and the 1755 earthquake. The earthquake greatly aggravated the financial situation, and both the reports of the Papal Nuncio in Lisbon⁵⁶ as well as those of other contemporaries suggest that the public finances were in dire straights in the years following the disaster. Although we do not have detailed accounts of the state of the public finances in Portugal before 1762, the finances of the Royal Household can be used as indirect proxies for this period. Figure 5 presents the Royal Household's expenditures and revenues obtained from archival work for the 1742-1757 period.

Fig. 5_ Total Expenditures and Revenues of the Royal Household (thousand *reis*)



Source: Arquivo da Casa Real, Portuguese National Archives, livros 1383-1386

Figure 5 suggests that, in the immediate years after the earthquake, crown revenues declined substantially, causing the Royal Household to cut down expenditures. The public finances got to such a deplorable state that in 1762, the Portuguese government had to ask for a substantial loan from Britain in order to face a military threat from Spain. The loan was denied⁵⁷. In 1762, the first year that we have reliable figures for the period, Fernando Tomás estimates that governmental revenues and expenditures were clearly below average, increasing in the ensuing years due to the military threat from Spain during the Seven Years

⁵⁵ Silva "Finanças Públicas"

⁵⁶ Pinto Cardoso *O Terrível Terramoto*

⁵⁷ Rocha and Sousa "Moeda e Crédito"

War and the improvement in revenue collection enabled by the creation of the Royal Treasury⁵⁸ (see below). The burden of the reconstruction effort was shared by the State, the Church and by private individuals. Shortly after the earthquake, the merchants offered a donation of 4% of all their transactions to the reconstruction of the capital, and Pombal ordered the newly formed *Junta do Comércio* (an association of businessmen which aimed to supervise all commercial and industrial activities) to take charge of the operations concerning the collection and disposal of the funds raised. Between 1762 and 1776, the revenues of the 4% donation totaled around 5,000 *contos*. For the same period, additional colonial donations to the reconstruction of the capital (mostly from Rio de Janeiro) added up to 2,720 *contos*⁵⁹. The *Junta do Comércio* had vast powers to inspect all commercial activity in Portugal, and all the merchants (national or foreign) were subject to its supervision. In one of its first regulations, the Junta introduced an extraordinary 4% duty on all imports for the reconstruction of Lisbon. The British traders asked for their dispensation from the duty, in light of the 1654 Treaty between Britain and Portugal, which secretly established that British products would be subject to a 23% *ad valorem* duty⁶⁰. Pombal denied the request, becoming the first strain in Anglo-Portuguese relations.

3.2.2. International Trade and the Decline of the British Trade

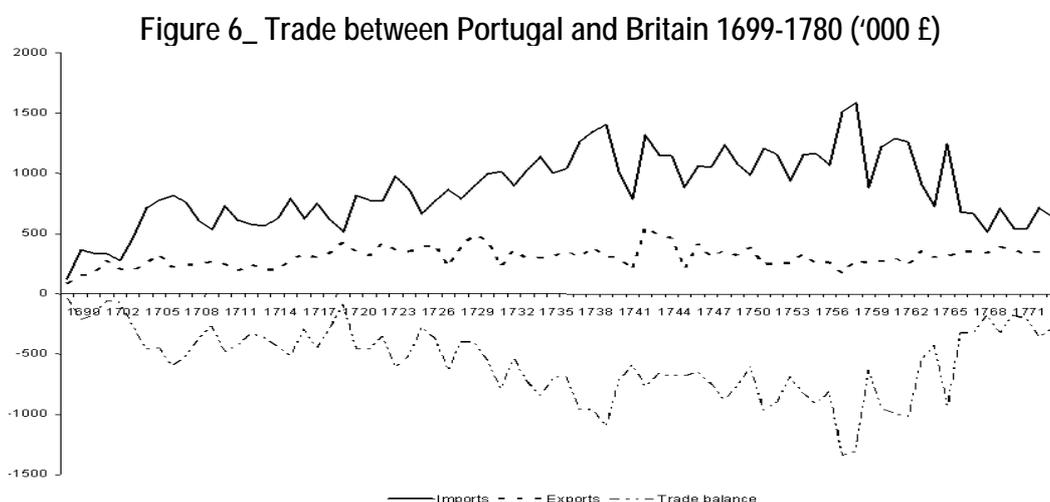
The earthquake had also substantial short- and medium-term consequences for the Portuguese trade balance. In the short run, there was a substantial increase in the volume of imports both from Portugal's main trading partner (Britain) as well as from other countries (such as Sweden and Russia), and a considerable decline in exports (Figure 6). After 1755, Portugal's imports included not only aid-related items, but also commodities needed for the

⁵⁸ Tomás "As Finanças"

⁵⁹ Tomás, *idem*.

⁶⁰ Estorninho "O Terramoto", p. 27

reconstruction, especially wood and iron. According to H. E. S. Fisher⁶¹, there was a clear change in the pattern of imports from Britain. Textiles imports declined sharply from an average of about £1 million in the 1750s to £709,000 in 1761-65 and about £460,000 in 1766-70. During this period, the only imports from Britain that increased in value were wrought iron wares. In turn, the sharp increase in imports (needed for both the reconstruction effort and to maintain the supply of essential goods) led to a very substantial increase in the Portuguese trade deficit, enhancing the gold outflow from the country to its main trading partners, especially Britain, which absorbed more than 80 per cent of the total gold outflows⁶².



Source: Fisher ("The Portugal Trade")

Between 1740 and 1755, Portugal exported an annual average of 3,260 *contos* (equivalent to £906,000) of gold (figure 8b). In the five years after the earthquake, gold exports increased to an average of about 5,000 *contos* (£1.4 million), with a peak in 1756 and 1757 in which gold exports exceeded 6,300 *contos* or £1.75 million⁶³. Since Portugal was at the time mostly a gold economy⁶⁴, the rise in the exports of bullion led to a considerable decline in the money supply (Figure 7a). Even so, as we saw in section 2, the prices of the main commodities increased in the immediate years after the disaster. These large exports of bullion were also

⁶¹ Fisher "Anglo-Portuguese Trade"

⁶² Sousa *Moeda*

⁶³ Sousa *Moeda*

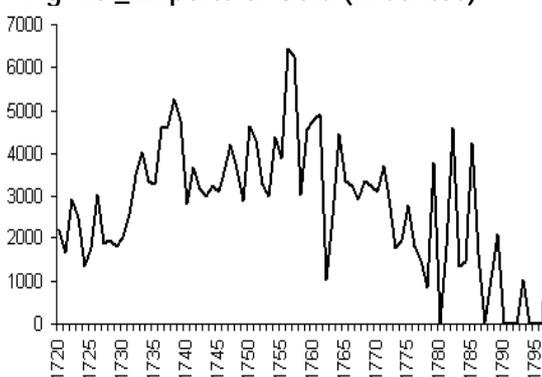
⁶⁴ Gold accounted for about 90% of the total money supply at the time.

supplemented by a flourishing illegal contraband of gold out of the country⁶⁵. In order to sustain the reconstruction effort and to reduce the rate of the gold outflow, the government was forced to redirect its imports, from Britain to countries that exported wood and iron, such as Sweden and Russia. This is confirmed by a prominent British merchant, who among other factors, attributed the decline in trade with Portugal to “the very considerable sums... annually paid since the Earthquake to Russia, Denmark, Sweden & Holland for Timber & Iron to rebuild the City [which] had a great Effect upon the sale of our Goods by drawing off ... Money⁶⁶”. Although bilateral trade statistics are not complete for the period, this increase in imports from other countries is confirmed by Preceptor Hildebrand⁶⁷, who showed that not only Portugal was the second largest importer of iron from Sweden, but also that these imports increased steadily during the 1755-1785 period, rising from an average 2400 tons per annum in the late 1750s to about 5,250 tons per year in the mid 1780s. Although after 1785, bar iron imports declined somewhat, they remained large until the start of the Napoleonic wars.

Fig. 7a _ Total Gold Supply (in *contos*)



Fig. 7b _ Exports of Gold (in *contos*)⁶⁸



Source: Sousa (*“Moeda”*) and Fisher (*“Anglo”*)

⁶⁵ Lynn Sunderland (*“A London Merchant”*) argues that, after 1755, besides the unprecedented gold outflows to Britain, there was a substantial smuggling of bullion. Thus, many of the British merchants that sustained losses with the earthquake changed the nature of their trade from, say, woolen imports to Portugal to bullion exports to Britain, which allowed for a substantial increase in their profit margins.

⁶⁶ Cited in Fisher *The Portugal Trade*, p. 48.

⁶⁷ Hilderbrand *“Foreign Markets”*.

⁶⁸ The figures of Sousa were corrected for the period 1761-1770, according to the information on the imports of Brazilian gold available in Fisher (*“Anglo-Portuguese”*).

In sum, the relief and reconstruction efforts induced a massive increase of the trade balance deficit, a sharp increase in the gold outflows, and a marked change in the pattern of imports.

3.2. The Opportunity to Reform

The greater fiscal restraint and the burgeoning trade deficit led to an unsustainable economic situation for the government, providing Pombal with the perfect excuse to implement a mercantilist policy that promoted the import substitution of manufactured products and state-sponsored industrial development⁶⁹. The main objective of this mercantilist policy was to reduce the dependency on foreign manufactured goods, which was the main cause of the massive gold exports to Portugal's main trading partners. More specifically, the main aim of Pombal's policy was to reduce Portugal's overwhelming economic dependency from Britain, by transferring some of the sectors of the Portuguese economy to the control of its own nationals⁷⁰. Although a nationalist at heart, Pombal did not want to completely antagonize Britain, since he was well aware that Portugal's independence from Spain was greatly dependent from the old trade and military alliance with Britain. Nevertheless, by imposing a 4% duty on all imports (including the British) to the reconstruction of Lisbon, by granting monopoly rights to Portuguese nationals in the Brazilian trade, and by protecting national industries from foreign competition, the trade with Britain was severely affected, declining more than 40% in the 1760s and even further in the decades following the earthquake. The British merchants blamed the mercantilist policies pursued by the Portuguese government for their difficulties⁷¹. However, Pombal's typical justification for these policies was that the earthquake had ruined the

⁶⁹ According to Jorge Pedreira ("A Indústria", p. 197): "The arrival to power of ... Pombal... and the afflictions caused by the earthquake of 1755, by the fall in the inflows of Brazilian gold and by the general difficulties of the colonial commerce, combined to make approve a set of measures that aimed for a reinforcement of the State, the increase of revenues and the reduction of the unbalances of the trade balance"

⁷⁰ Maxwell *Pombal*.

⁷¹ Fisher *The Portugal Trade*, Maxwell *Pombal*.

State and the economy, and hence they were strictly necessary for the economic survival of Portugal. Consequently, notwithstanding the British protests, the policies remained in place.

In terms of import substitution, although the main package of policies of industrial promotion was implemented after 1770, when the financial crisis became more acute, the first measures directed to the industrial sector appeared already in 1757 with the reform of the State-sponsored Lisbon silk factory. In the following 20 years, until the death of the king and Pombal's subsequent dismissal from his post, the government sponsored industrial development by investing directly with its own funds or by using new and existing taxes. For instance, the 4% donation from merchants to the reconstruction of Lisbon and the similar 4% duties imposed on imports were both used by Pombal in his policy of industrial development. In addition, the government also granted several monopoly privileges to industrialists carefully picked by the overseeing hand of the *Junta do Comércio*, in order to promote its import-substitution policies. From 1755 until 1769, 15 new industries or "factories" were established (including sugar refining, ceramics, paper, textiles, cotton, and linen), and 56 others were introduced from 1770 to 1777. After Pombal left government in 1777, the policy was maintained for a while, and 238 new factories were established from 1778 until 1788.⁷²

The second set of reforms implemented by the Pombal government focused on the reorganization the State. Before 1755, the revenues of the central government were collected by a plethora of organisms and institutions, including the *Conselho da Fazenda* (responsible for the Crown revenues), the *Conselho Ultramarino* (collector of the tax revenues from the colonies), the *Junta do Tabaco* (which controlled the tobacco revenues), as well as several political and economic courts, mostly attached to the military orders⁷³. These institutions had additional layers of bureaucrats, which included *provadores* and *contadores* (monitors and tax inspectors), *corregedores* (in charge of important taxes like *sisas* and other local government's

⁷² Pedreira "A Indústria", p. 201

⁷³ Subtil "Instituições".

functions), *almotacés* (responsible for all matters related to foodstuff), customs officials (who dealt with the internal and external trade), and many other central and local government officials. This multiplication of institutions and individuals bred inefficiency in revenue collection, fomented the waste of resources, and did not allow the Crown to have an accurate picture of all its own revenues and expenditures⁷⁴. The earthquake not only struck a lethal blow to this chaotic situation, but also (together with the fire) was also directly responsible for the total destruction of the main arm of the Treasury, the *Casa dos Contos*, leaving its services in a truly anarchic state. The loss of the *Casa dos Contos* and the financial difficulties were contributing factors to the biggest reorganization of the State finances in the modern era⁷⁵.

Following similar trends in Europe, the movement towards the centralization of the central government was announced in a law (*alvará*) dated from November 13, 1756, which stated that “Common Good should precede everything else”, and thus established the principle of the primacy of the State vis-à-vis the rest of the society. On December 16 the statutes of the *Junta do Comércio* were approved, an institution constituted by merchants who worked together with the government in setting up economic policies for the commercial and industrial sectors. In December 1761, a new law created the Royal Treasury (*Erário Régio*), the institution around which all royal financial services were centralized. The Royal Treasury was under the direct supervision of Pombal himself, who also became its first inspector general. According to Kenneth Maxwell⁷⁶, the creation of a centralized Treasury was likely inspired in the British model and became “the key element in Pombal’s overall effort of rationalization and centralization”, in which the jurisdiction of all fiscal matters were centralized and all Crown’s income was concentrated and recorded. The centralization of the operations not only

⁷⁴ Subtil, *idem*, p. 273.

⁷⁵ Tomás “As Finanças”, Subtil “Instituições”.

⁷⁶ Maxwell *Pombal*, p. 90.

dramatically improved efficiency, but also allowed for the introduction of new taxes, including the *décima* in 1762, which became one of the most “modern” taxes in Europe⁷⁷.

In short, earthquake-related financial difficulties, the large trade imbalances, and the rise to power to the Pombal-led reformist group, all contributed to the sweeping institutional changes that enabled a revitalization of the Portuguese economy in the second half of eighteenth century. Even so, and although the post-1755 reforms were unequivocally instrumental to improve the performance of the Portuguese economy and were important to promote an indigenous path of development, they were not enough to break the traditional structures of the *ancien régime*⁷⁸. The final blow to these structures only occurred after the French invasions and, most notably, after the 1820 Liberal revolution.

4. Concluding Remarks

By combining new archival and existing data, this paper is the first thorough study of the economic impact of the 1755 earthquake. This paper presents new estimates for death casualties and damages of the Lisbon 1755 earthquake. The direct cost of the 1755 earthquake is estimated to be between 32 and 48 percent of the Portuguese GDP. Prices and wages rose after 1756 and remained fairly volatile in the years afterwards, and the reconstruction effort led to a rise in the wage premium of skilled construction workers. The earthquake was also crucial for the implementation of a mercantilist policy aimed at improving the trade deficit and the public finances. All in all, the findings of this paper suggest that the earthquake had a greater impact on the Portuguese economy than the existing literature indicates⁷⁹. In spite of a terrible casualty toll and significant wealth losses, in the long run the 1755 earthquake was beneficial to the Portuguese economy. The disaster was an exogenous

⁷⁷ Silva “As Finanças”.

⁷⁸ Castro “A Política”.

⁷⁹ The earthquake also struck with tremendous force one of the most stable and enduring institutions of eighteenth century Portugal, the Church and the Inquisition. The heavy losses and Pombal’s policy of secularization of the society were other enduring consequences of the 1755 earthquake. Future research will be devoted to this theme.

shock, which provided an opportunity to reform the economy. The long-term economic performance benefited accordingly, and the situation of economic semi-dependency vis-à-vis Britain was reduced.

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